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ABSTRACT

This is one form of three performance checks booklets (A, B, and C) for Level II of the Intermediate Science Curriculum Study (ISCS). The three booklets are considered one of four major subdivisions of a set of individualized evaluation materials for Level II of the ISCS. This booklet (form C), developed to assess the students' achievement of the objectives of Level I, contains a set of performance checks equivalent to the performance checks of the other two forms (A and B). Each performance check has its own code number which indicates the unit number and identifies whether it is based on core material or excursions. Directions for students' use of performance checks are also included. (HM)

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INTERMEDIATE SCIENCE CURRICULUM STUDY

ED178276

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INDIVIDUALIZED TESTING SYSTEM

Performance Checks

ISCS LEVEL II
FORM C

SE 028 469

SILVER BURDETT
GENERAL LEARNING CORPORATION
Morristown, New Jersey · Park Ridge, Ill. · Palo Alto · Dallas · Atlanta

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INDIVIDUALIZED TESTING SYSTEM

ALL LEVELS
Individualizing Objective Testing (an ITP module)
Evaluating and Reporting Progress (an ITP module)

LEVEL I
Performance Objectives, ISCS Level I
Performance Checks, ISCS Level I, Forms A, B, and C
Performance Assessment Resources, ISCS Level I, Parts 1 and 2

LEVEL II
Performance Objectives, ISCS Level II
Performance Checks, ISCS Level II, Forms A, B, and C
Performance Assessment Resources, ISCS Level II, Parts 1 and 2

LEVEL III
Performance Objectives, ISCS Level III
Performance Checks, ISCS Level III, ES-WB, Forms A, B, and C
WYY-IV, Forms A, B, and C
IO-WU, Forms A, B, and C
WW-CP, Forms A, B, and C
Performance Assessment Resources, ISCS Level III, ES-WB
WYY-IV
IO-WU
WW-CP

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FOREWORD

To implement an educational approach successfully, one must match the philosophy of evaluation with that of instruction. This is particularly true when individualization is the key element in the educational approach. Yet, as important as it is to achieve this match, the task is by no means simple for the teacher. In fact, without specific resource materials to help him, he is apt to find the task overwhelming. For this reason, ISCS has developed a set of individualized evaluation materials as part of its Individualized Teacher Preparation (ITP) program. These materials are designed to assist teachers in their transition to individualized instruction and to help them tailor their assessment of students' progress to the needs of all their students.

The two modules concerned with evaluation, *Individualizing Objective Testing* and *Evaluating and Reporting Progress*, can be used by small groups of teachers in in-service settings or by individual teachers in a local school environment. Hopefully, they will do more than give each teacher an overview of individualized evaluation. These ITP modules suggest key strategies for achieving both subjective and objective evaluation of each student's progress. And to make it easier for teachers to put such strategies into practice, ISCS has produced the associated booklets entitled *Performance Objectives, Performance Assessment Resources*, and *Performance Checks*. Using these materials, the teacher can objectively assess the student's mastery of the processes, skills, and subject matter of the ISCS program. And the teacher can obtain, at the moment when they are needed, specific suggestions for remedying the student's identified deficiencies.

If you are an ISCS teacher, selective use of these materials will guide you in developing an individualized evaluation program best suited to your own settings and thus further enhance the individualized character of your ISCS program.

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NOTES TO THE STUDENT

Now that you have completed several chapters, excursions, and self-evaluations, you are ready to help your teacher determine how well you are doing. The performance checks in this book will provide your teacher with this information. Then your teacher can help you with things you may not understand and can keep a record of your progress.

Read the next section carefully. It explains some important things about the performance checks in this book, and it gives you specific suggestions for using them.

What You Need To Know about Performance Checks

1. **You do performance checks when you are ready.** Performance checks are somewhat like the questions in the self-evaluations – you do them when you are ready, not when the whole class is ready.
2. **Your teacher or both of you decide how many you do.** Your teacher or you and your teacher together will decide which ones you should do. You are not expected to do all of the performance checks.
3. **There are three forms for each performance check.** Every performance check is written in three forms – A, B, and C. (The title of this booklet tells you whether it is Form A, B, or C.) Usually the answers for each form are different. When you do a check, you will use only one form. The A, B, and C forms are always in different booklets. Within each booklet all the performance objectives for the same unit are listed together. A unit contains two or three chapters and their related excursions. These units are in numerical order. Each unit has performance checks based on core material and performance checks based on excursions.
4. **Each performance check has its own number.** The number is in the outside margin of the page and will look like this: 03-Core-17A or 05-Exc 17-2-2A. These numbers mean

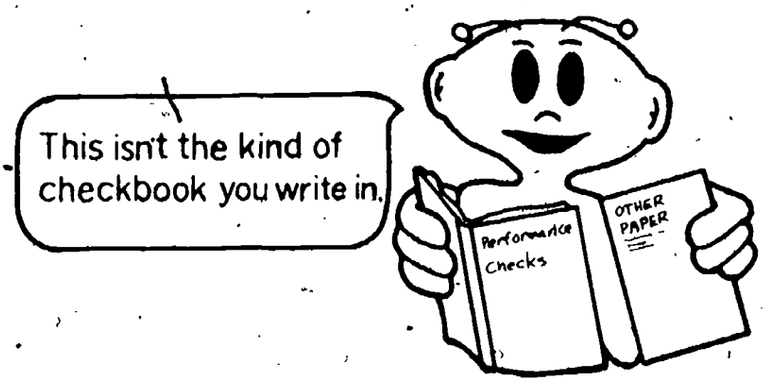
03	-	Core	-	17	A	and	05	-	Exc	17-2	- 2	A
unit		based on core material		check number		form of the check	unit		based on excursion material	excursion number	check number	form of the check

5. **Each performance check is separated from the other.** There is a line before each performance check and one after it. Some performance checks have several parts, so do everything called for between the lines. If there is no line at the bottom of a page, the check is continued onto the next page.

6. **Sometimes you will need to use equipment.** If special materials are needed, they will be in boxes labeled with the same number and sometimes the same letter too as the performance check for which you need them.

7. **Some performance checks have two or more answers.** If more than one answer is correct, you must select all the correct choices. In such cases selecting just one answer is not enough.

8. **Some performance checks have no answers.** Occasionally, you may be asked to do something that is impossible and to explain your answer. If so, say that the task is impossible and explain why.



9. **You share books of performance checks and YOU DO NOT WRITE IN THEM.** Write your answers on other paper. Give the number and form of the performance check for each answer you write. If you are to draw a graph, your teacher may provide you with grid paper.

10. **Your teacher or his assistant will collect and mark your checks.** And sometimes you must ask him to watch or assist you as you do a check.

11. **Sometimes a review procedure will be suggested.** If you can't do a performance check, you may be asked to review a part of the text or a self-evaluation question. You may then be checked on the same material, so be sure you understand the material you review. Get help if you need it.

All that is known about moon material samples X and Y is given in the table below. No other information is available. **01-Core-1C**

1. Using only this information, can you be certain that samples X and Y are different substances?
2. Explain your answer.

	SAMPLE X	SAMPLE Y
Luster	dull	dull
Mass	8 g	9 g
Texture	fine	coarse
Color	red	red

If you spill an unknown or dangerous chemical on yourself or someone else, what are two things you should do? **01-Core-2C**

Get any materials you need in addition to those in box 01-Core-3 to complete this item. Place ¼ of a teaspoon of powder from the bag into a beaker. Add about 5 drops of the acid in bottle F to the powder. Record the observations that you make. **01-Core-3C**

Get a piece of rock and a piece of shell from the supply area and enough of the powder from bottle 01-Core-4C to cover the bottom of a test tube. You may use any or all of the following: a bottle of hydrochloric acid (HCl), a magnifying glass, safety glasses, and a graduated cylinder. **01-Core-4C**

1. Is the powder more like rock or like shell?
2. Explain your answer.

Get two baby-food jars. Label one X and the other Y. In the supply area are two bags of powder labeled 01-Core-5X and 01-Core-5Y. Get a small sample of each powder and a dropper bottle of HCl. If your room has an acid area, do your test there. **01-Core-5C**

1. Which sample is rock powder?
2. Which sample is shell powder?
3. How did the observations you made allow you to identify which powder came from rock and which powder came from shell?

Roz crushed a solid object that she picked up on a camping trip. Which of its properties will probably change the least? **01-Core-6C**

a. Its roughness
b. Its reaction with HCl
c. Its shape
d. Its size

01-Core-7C Suppose you were to shrink in size until you were able to walk inside a piece of gold.

1. Draw a diagram showing how the inside of this piece of pure gold might look to you.
2. Explain your diagram.

01-Core-8C Choose the best answer below. In science, models are

a. invented in the minds of people to explain what they have observed.
b. things that our best scientists have seen with their eyes.
c. unchanging facts.
d. reports of the way it is inside of matter.

01-Core-9C Select any statements below which are part of the particle model of matter.

a. There is only one kind of matter particles.
b. Matter particles are closest together in a solid.
c. Heat energy increases the motion of matter particles.
d. Matter particles move at a constant speed.
e. Particles of matter can move.

01-Core-10C Select the letter of the choice below which best completes the statement. A scientific model

a. always provides correct answers to scientific questions.
b. is correct because it is based on the laws of nature.
c. is used because it helps to explain observations and to predict other observations, not because it is known to be correct.
d. is either right or wrong, so it is discarded when it does not agree with new experiments.

01-Core-11C Select the statements which are true about a scientific model.

a. It relates sets of observations.
b. It is a means by which scientists explain sets of observations.
c. It can include a physical object or a set of objects.
d. It is an observation.

01-Core-12C Copy the numbers of the words below. Tell whether each substance is found at ordinary room temperature as a solid, a liquid, or a gas. Write S (for solid), L (for liquid), or G (for gas) after its number on your paper.

1. Oxygen
2. Sandstone
3. Steel
4. Air
5. Water
6. Alcohol
7. Sandpaper
8. Cider

01-Core-13C List two things that a good scientific model does for a scientist.

State a definition for the word *mass*. **01-Core-14C**

Below is a list of words. Copy them onto your paper. Place a P after those things which are made up of particles. Place an M after those things which are made up of matter. You may place both a P and an M after the same word. **01-Core-15C**

1. Lake
2. Helium
3. Hate
4. Steel
5. Jelly

On your paper, copy the five words listed below. Place an M after those things which have mass. Place an X after those things made up of matter. You may place both an M and an X after a word. **01-Core-16C**

1. Musical note
2. Air
3. Fog
4. Meat
5. Love

Nitrogen dioxide is an orange-brown gas. What would you have to show about nitrogen dioxide to prove that it is matter? **01-Core-17C**

Get a balance and a set of gram masses. Then, from box 01-Core-18, get a small rock and a carbon rod. Find the mass of each of the objects from the box as closely as possible. Write the name of each object and its mass on your answer sheet. **01-Core-18C**

If a jar contains 20 cc of water, what is the water volume in ml? **01-Core-19C**

Get bottle 01-Core-20C, and fill it with water to the line marked on the side. Use a graduated cylinder to determine the volume of water in the bottle. **01-Core-20C**

Sally filled a beach ball with a gas. **01-Core-21C**

1. Is the gas in the ball matter?
2. How do you know?

Get a beaker ¼ full of water. Put the glass end of an empty medicine dropper into the water. Squeeze the rubber cap of the dropper. What, if any, is the state or form of matter coming from the dropper? **01-Core-22C**

01-Core-23C On the sketch provided by your teacher, mark the place where each of the following is normally stored.

1. Bucket of sand
2. Fire blanket
3. Safety goggles
4. CO_2 or soda-acid fire extinguishers
5. First-aid kit

01-Core-24C Your teacher will observe you for this check when he can.

01-Core-25C Your teacher will observe you for this check when he can.

01-Core-26C Your teacher will observe you for this check when he can.

01-Core-27C Your teacher will observe you for this check when he can.

01-Core-28C Your teacher will observe you for this check when he can.

01-Exc 2-2-1C Listed in Column A below are six quantities commonly measured in science. Copy them onto your paper.

From Column B, choose the metric unit used to express each of these quantities and write it on your paper after the quantity it matches.

Column A (Quantities)	Column B (Units)
1. Mass	gram/milliliter
2. Volume	mile/hour
3. Speed (distance/time unit)	ounce
4. Temperature	meter/second
5. Length	gram
6. Density (mass/unit volume)	pint
	yard
	°C
	milliliter
	°F
	meter
	ounce/cu in

01-Exc 2-3-1C Pretend that it is the year 2001, and you have been chosen to build a spaceport on Pluto. While on Pluto you see a diamond the size of a football. List two of the three things that would determine the weight of the diamond on Pluto.

Select the letter of the property of a solid that would be different on the earth, the moon, and Jupiter. **01-Exc 2-3-2C**

a. Volume
b. Shape
c. Weight
d. Color

Record the letter of the choice below which lists the important factors that determine your weight on earth. **01-Exc 2-3-3C**

a. Your mass, volume, and distance from the center of the earth
b. Your mass, the earth's mass, and the distance the earth is from the sun
c. Your mass and distance from the center of the earth, and the earth's mass
d. None of these

Get jars A and C from box 02-Core-1 at the supply area. What is the state of the matter, if any, in each of the jars? **02-Core-1C**

Jack and Jill decided to develop an experiment on planaria. They decided to work separately to check each other. When they compared their results and conclusions, they found them very different. They decided that at least one of them had not followed the procedure they had decided on. **02-Core-2C**

1. Is it possible that both Jack and Jill had followed exactly the same procedure?
2. Explain your answer.

Joe mixed HCl and baking soda. A gas was given off. He tested the gas with a burning match, which went out. Mrs. Apple asked him if the gas was helium. Joe said, "It might be, but I don't know for sure." **02-Core-3C**

1. Was Joe right in saying that he could not tell what the gas was even though he had tested it with a burning match?
2. Explain your answer.

Operational definition I: Air is a gas which keeps a match burning evenly, does not change phenol red, and does not change limewater. **02-Core-4C**

Operational definition II: Air is a gas which is colorless, odorless, and tasteless.

Operational definition II says air can be detected or identified by observing the properties of the gas itself. It takes less work than the first operational definition.

1. Is operational definition II as useful as operational definition I?
2. Explain your answer.

Joan noted the behavior of the gases thaton and dearon. She listed her data in the table below. **02-Core-5C**

TEST	GAS	
	THATON	DEARON
Color	pink	pink
Reaction with a lighted match	burns	burns
Reaction with teon gas	forms yellow powder	forms yellow powder
Reaction with a certain solution	no change	turns it blue

She then operationally defined *thaton gas*. Thaton gas (1) is pink, (2) burns, and (3) forms a yellow powder when it reacts with teon gas.

1. Is this a good operational definition for *thaton gas*?
2. Explain your answer.

02-Core-6C

All the statements below are true. Select the letters of any of the statements which are operational definitions.

a. Nitrogen is one of the gases in air.

b. Iodine is a purple gas that forms when a substance that contains it is heated.

c. Oxygen is a gas that causes a glowing splint to burst into flame when the splint is placed into a container of the gas.

d. Hydrogen is a colorless, odorless, and tasteless gas.

02-Core-7C

Consider the following facts.

a. Sodium particles are present in many materials.

b. Substances containing sodium turn a colorless flame to a bright orange.

c. Like substances containing potassium and ammonium, materials containing sodium are soluble.

d. Most materials which have sodium particles in them are white. Choose the one statement above that is an operational definition for *sodium particles.*

02-Core-8C

Peggy collected the gas given off when she heated some soda pop. She also collected the gas given off by chalk and hydrochloric acid. She found that both gases turned limewater cloudy white and put matches out. How could soda pop and chalk, which are so different, both give off gases which react the same way?

02-Core-9C

Samples of air, hydrogen, carbon dioxide, and an unknown gas were tested. The results are shown in the table below. List the sample numbers on your answer paper. After each sample number, write the name of the gas.

GAS TESTED	TEST RESULTS		
SAMPLE	LIMEWATER	BURNING MATCH	PHENOL RED
1	no change	keeps it burning	no change
2	no change	explodes	no change
3	no change	puts it out	turns it clear
4	turns it cloudy	puts it out	turns it yellow

02-Core-10C

1. Name the products in the reaction below.
2. Name the reactants in the reaction below.

hydrogen sulfide + cadmium nitrate → hydrogen nitrate + cadmium sulfide.

02-Core-11C

Write a word statement for the following chemical reaction. Silver sulfide and sodium nitrate are formed when sodium sulfide reacts with silver nitrate.

02-Core-12C

Copy the list of words given below onto your answer sheet. Place a G after the things which are gases. Place an M after those things which are matter. You may place both a G and an M after a word.

1. Air
2. Water
3. Oxygen
4. Light
5. Wind

Study each of the following reactions that Willie did which involved hydrogen sulfide (H_2S). **02-Core-13C**

A: colorless liquid A + H_2S → black solid A + colorless liquid
B: colorless liquid B + H_2S → black solid B + colorless liquid
C: colorless liquid C + H_2S → black solid C + colorless liquid
D: colorless liquid D + H_2S → white solid D + colorless liquid

Willie then tested the black solids as follows.

BLACK SOLIDS	FORMS WHEN HEATED WITH CARBON	REACTION WITH HYDROCHLORIC ACID
A	orange-brown metal	none
B	dull gray metal	slow
C	orange-brown metal	none

Which of the colorless liquids in the reactions above probably contain similar matter particles?

Select any of the procedures below in which a control is used. **02-Core-14C**

a. Lynn heated a solid, green material. It turned yellow, and something that looked like water came out of the test tube. He didn't have any plain water, but he had a colorless salt solution handy. He added half the salt solution to the yellow stuff, and it turned green.

b. Barry wanted to know if rats grew faster if they were fed milk and cereal or just cereal. He divided the rats into three groups. He fed group 1 just cereal. He fed groups 2 and 3 cereal and different amounts of milk.

c. Kay wanted to see if a new plant food really worked. She put the plant food on one tray of bean plants. The plants grew very well.

d. Dr. Heinrich Hudson thinks that taking lots of vitamin C will prevent colds. He took four vitamin C tablets a day all winter and never got a cold.

What is a control in an experiment? **02-Core-15C**

What is the reason for using a control when an experiment is being done? **02-Core-16C**

A strange, sticky material has just been found at the bottom of a lake in Canada. You are a scientist at the Canadian National Chemical Company. What would you need to do to identify the matter particles contained in the material? **02-Core-17C**

02-Core-18C

Theron blue turns pink if X matter particles are present. Braten orange turns green if Y matter particles are present. Theron blue solution is put into four test tubes. Braten orange solution is put into four other test tubes. A small amount of solution 1, 2, 3, or 4 is added to each sample of braten orange and theron blue. The results are shown in the table below.

SOLUTION ADDED	THERON BLUE	BRATEN ORANGE
1	turns pink	no change
2	no change	turns green
3	no change	no change
4	turns pink	turns green

Select any of the following which agree with the data in the table.

a. Solutions 1 and 2 contain the same type particles.
b. Solution 3 contains neither X nor Y type particles.
c. Solutions 1 and 3 contain the same type particles.
d. Solution 4 contains neither X nor Y type particles.
e. Solutions 2 and 3 contain the same type particles.

02-Core-19C

Suppose that there are one trillion different materials known.

1. Would the number of different kinds of matter particles be less than, equal to, or greater than one trillion?
2. What evidence do you have that supports your answer?

02 Exc 3-1-1C

Hydrochloric acid (HCl), vinegar, and lemon juice all reacted with eggshell as shown below. What clue does this give you about the makeup of the HCl, vinegar, and lemon juice?

hydrochloric acid (solution) + eggshell → carbon dioxide
vinegar (solution) + eggshell → carbon dioxide
lemon juice (solution) + eggshell → carbon dioxide

02-Exc 4-1-1C

There are many variables in the problem below. Name the variable which changes because other things are changed on purpose.

Problem: A paint manufacturer wants to know which of four paints will fade the least from the effects of the weather.

02-Exc 4-1-2C

In the following problem, identify at least two variables which must be kept constant if the experiment is to have usable results.

Problem: A shoe manufacturer wants to know which of four materials will best resist friction and therefore be the best material for shoes.

02-Exc 4-2-1C

Excursion 4-2 explained a new, sensitive way to detect the presence of iodine in a substance. Describe the main steps you would take to carry out that procedure. If you would like to review the less sensitive procedure, you may look at page 55 in your text.

When wood, coal, Styrofoam, turpentine, and thousands of other materials burn, carbon (soot), carbon dioxide, or both are formed. In Excursion 4-3 you experimented with several of these materials. What conclusion can you make about their makeup?

02-Exc 4-3-1C

Copy the list of words below onto your paper. Write E after those things which are made up of elements or combinations of elements. Write M after those things which are made up of matter. You may put an E and an A after the same word. **03-Core-1C**

1. Plastic
2. Breath
3. Respeet
4. Cloud
5. Paper

What term is used for a kind of matter which is made up of one and only one kind of atom? **03-Core-2C**

Give the name for the kind of matter particles which make up elements. **03-Core-3C**

If each of the letters in the diagrams below represents a different kind of atom, which diagram best represents an element? **03-Core-4C**

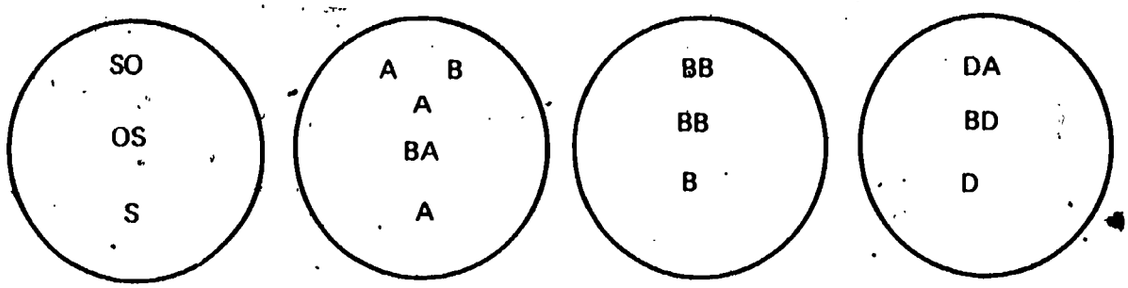


Diagram a Diagram b Diagram c Diagram d

Copy the list of words below onto your paper. Write M after those things which are matter. Write A after those things which are made up of atoms. You may put both an M and an A after a word. **03-Core-5C**

1. Pressboard
2. Heat
3. Rain
4. Glass
5. Golf balls

Jerry has samples of 25 different elements. According to the model you and Iggy developed for matter, how many different kinds of atoms does Jerry have? **03-Core-6C**

a. 25
b. Probably about 6 or 7
c. 50
d. Several billion
e. Impossible to tell

03-Core-7C How many materials are there that cannot be broken down into other materials by chemical means?

a. About 70,000
b. About 100
c. About 3,000
d. About 9

03-Core-8C Diagram the way a small piece of the element potassium might look if it were magnified so that you could see the atoms of potassium. Explain your diagram.

03-Core-9C The formula for potassium chloride is KCl. Cl is the symbol for the element chlorine. How many kinds of atoms does the symbol Cl stand for?

03-Core-10C Iggy has a nut and bolt combination made up of two long bolts (Lb), three red nuts (Rd), and six blue nuts (Bn). Select the formula below which fits Iggy's combination.

a. $Lb_2Rd_3Bn_6$
b. $Lb_3Rd_6Bn_2$
c. $Lb_6Rd_3Bn_2$
d. $2LbRd_3Bn_6$
e. $6LbRdBn_2$

03-Core-11C Ron wrote the formulas shown below for his four combinations of nuts (Br and Pl) and bolts (In and Ha). Write the total number of parts represented in each of Ron's formulas.

1. In_2Br
2. $InHaBr_3$
3. InPl
4. Ha_2Pl_3

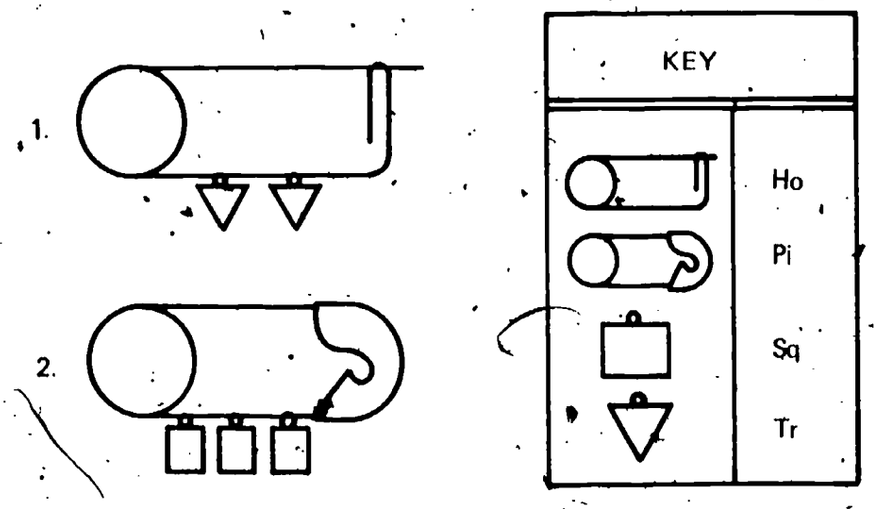
03-Core-12C Rosemary used the symbols Bl for long bolts and Hx for hexagonal nuts. When she put a pile of these nuts and bolts together in a certain way, her combination was $3Bo_2Hx_4$.

1. How many hexagonal nuts were in each unit of the combination?
2. How many units of the combination did Rosemary make?
3. How many long bolts were present in the total number of units of the combination formed?

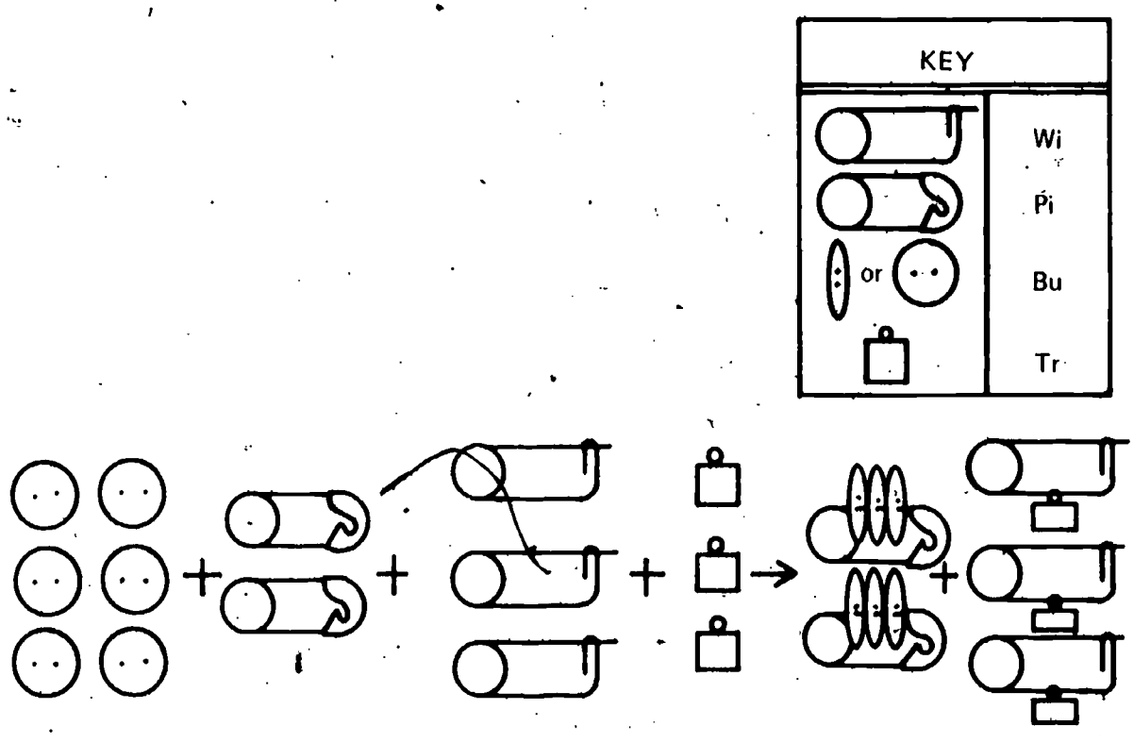
03-Core-13C Using your knowledge of symbols, formulas, elements, and particles, answer this question. How many different kinds of particles are in each of the following formulas?

1. K_2SiF_6
2. PtS_2

Using the key shown below, write a formula for each of the pin-button combinations pictured. **03-Core-14C**



Describe the reaction below in terms of symbols and numbers. The key shows the symbols for the pins and buttons used. **03-Core-15C**



A certain nut and bolt combination has the formula $Bo_2Hx_3Sq_2$. What does this formula tell you about the order in which its parts are combined? **03-Core-16C**

03-Core-17C

Select any of the choices below which will complete the sentence. Bob found an orange solid substance in a field. It is possible that the substance contains ___ kind(s) of atoms.

a. 4
b. 1
c. 2
d. a or b
e. a, b, or c

03-Core-18C

Doug found a very hard mineral. He remarked, "There's no way to find out what this mineral is made of because there are millions of different kinds of substances and so there are millions of different elements." Bert said that it is possible to find out what elements are in anything.

1. Do you agree with Doug or Bert?
2. Explain why the person you agree with is right.

03-Core-19C

Iggy's particle model says that only a small number of different kinds of atoms make up all the materials we know of. How can this be true?

03-Core-20C

Rose dissolved Easter egg dye in water, aspirin in water, and iodine in alcohol. What are the mixtures Rose formed called?

03-Core-21C

When potassium chloride is added to water and the two are stirred, the solid disappears. What happens to the solid?

03-Core-22C

When 6 grams of solid, white sodium nitrate are dissolved in 26 grams of a colorless liquid, the solid disappears and the liquid looks the same. The solution weighs 32 grams.

1. The number of atoms present in the 6 grams of sodium nitrate and the 26 grams of liquid before dissolving is (equal to, greater than, or less than) the number of atoms in the 32 grams of solution. Choose the phrase in parenthesis which completes the sentence correctly.
2. Explain your answer.

03-Core-23C

Amy has a beaker of a solution. She tests a 5 ml sample of it and finds that it contains a dissolved solid. She says she cannot be sure if the rest of the liquid contains the dissolved solid because she has tested only a sample.

1. Could a second or third sample of the liquid be different?
2. Explain your answer.

03-Core-24C

Cover the bottom of a test tube with calcium chloride and sodium chloride. Have your teacher check the amount of the solid you have in the test tube. Use an alcohol burner and any other materials you need, and heat the substance for two minutes. List your observations.

Carlos mixed two colorless solutions and produced a black solid in a colorless solution. What happened to the atoms of the reactants to make the products so different from the reactants? **03-Core-25C**

Karen heated the element inium, which she knew reacted with many elements, with an element outium, whose properties she didn't know. No reaction took place. Karen concluded that outium wouldn't react with any element because it did not react with inium. **03-Core-26C**

1. Do you agree with Karen's conclusion?
2. Explain your answer.

Janice prepared the following reaction. **03-Core-27C**

copper + nitrate acid → nitrogen oxide + copper nitrate + water

If there were 987 atoms of copper used as reactants, how many atoms of copper are present in the products?

a. Impossible to tell
b. Probably 987 plus a few
c. Probably 987 minus a few
d. Exactly 987
e. Either b or c

When barium iodide is added to sodium sulfate, the barium particles combine with the sulfate particles to form a cloudy white solid called *barium sulfate*. Rod mixes a solution of barium iodide with a solution of sodium sulfate. A cloudy white solid forms. How can Rod find out if all the sulfate particles are used up? **03-Core-28C**

Sharon did the following reaction. **03-Core-29C**

zinc + hydrochloric acid → 10.1 g zinc chloride + 0.2 g hydrogen
(10.3 g total products)

1. Select the phrase which makes the following statement true. The mass of the reactants was (greater than, equal to, less than) 10.3 g.
2. Since you weren't there when Sharon did the reaction, on what basis could you answer question 1?

03-Exc 5-1-1C

The names of the chemical elements come from a wide variety of sources. List the letters of all of the statements below which account for this variety. The elements were named

a. by a systematic scientific process.
b. using German or English names.
c. for the color of light they reflect.
d. for their distinctive odors.
e. for their appearance.
f. for continents, countries, and cities.
g. for gods, goddesses, and goblins.
h. for famous people.
i. for the people who discovered them.
j. by the people who used them.

03-Exc 6-1-1C

1. If 60,000 particles of potassium are dissolved in enough water to make 100 ml of solution, how many particles of potassium would you expect to find in a 5 ml sample of the solution?
2. State how the particles are distributed in the solution.

03-Exc 6-2-1C

For each of the four situations below, write the number of the situation and answer these two question.

(a) Has a chemical reaction occurred?
(b) How do you know?

Situation 1. Two blue solutions, A and B, are mixed. A colorless gas is given off, the resulting solution is colorless, and no solid is formed.

Situation 2. When a clear colorless solution X is added to a colorless solution Y, no gas is released, the solution is clear and pink, and no odor is observed.

Situation 3. A colorless solution of chemical A and a colorless solution of chemical B are mixed. No color change is observed in the solution, no gas is released, and a white solid settles to the bottom of the beaker.

Situation 4. Two solids each form a colorless solution when dissolved in water. When the two solutions are mixed, the resulting solution remains clear and colorless. No gas is given off, and no solid settles to the bottom. There is no temperature change.

03-Exc 6-3-1C

When hydrogen sulfide is added to cadmium chloride, the cadmium atoms combine with the sulfide atoms. A yellow solid, called *cadmium sulfide*, forms. Cheryl mixes 5 ml of hydrogen sulfide with 5 ml of cadmium chloride. The yellow solid forms and settles to the bottom. Explain how she could find out if all the cadmium particles are used up.

Rosemary observed the following reactions. **04-Core-1C**

$Pb + Cl_2 \rightarrow PbCl_2$
(element) (element) (compound)

$2K + I_2 \rightarrow 2KI$
(element) (element) (compound)

Based on this evidence, she wrote in her *Record Book* that the elements lead (Pb), potassium (K), iodine (I), and chlorine (Cl) were active, and therefore the following reactions will take place.

$Pb + K \rightarrow PbK$
$Cl_2 + I_2 \rightarrow 2ClI$
$K + Cl_2 \rightarrow 2KCl$
$Pb + I_2 \rightarrow PbI_2$

1. Do you agree or disagree with Rosemary's conclusion?
2. Why?

Kim had a bottle of a nitrate solution. He poured 50 ml of it into a beaker. He placed another 5 ml of the solution into a test tube. There are 20 nitrate atoms in the 5 ml of solution in the test tube. How many nitrate atoms are there in the beaker? **04-Core-2C**

a. 200
b. 100
c. 10
d. 2
e. There is no way to tell.

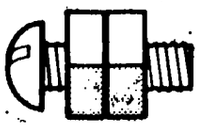
After several tests, Pete found that 14 particles of hydrogen react with 7 particles of oxygen to produce 7 particles of water. **04-Core-3C**

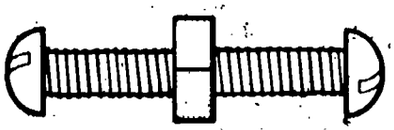
1. If Pete is given 21 particles of hydrogen, can he predict the number of particles of oxygen needed to use up all the hydrogen particles?
2. Can he predict how many particles of water will be produced?
3. Explain your answers.

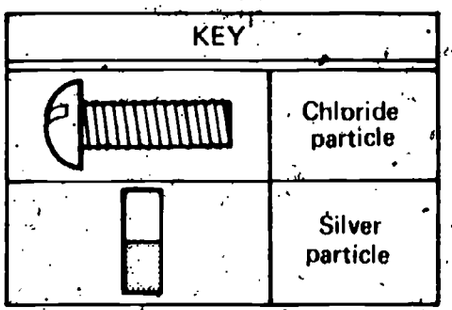
Murray has two solutions. One contains silver particles, and the other contains chloride particles. Suppose each ml of the chloride solution contains 5 chloride particles, and each ml of the silver solution contains 5 silver particles. Murray mixed 10 ml of the solution containing silver particles with 10 ml of the solution containing chloride particles. Select any of the combinations below which would cause you to predict that chloride particles would be left over. **04-Core-4C**

a. 

b. 

c. 

d. 



04-Core-5C Colorless solutions of sodium sulfide and zinc iodide are mixed. The zinc atoms combine with the sulfide atoms to form a yellowish-white solid. How could you find out if all the sulfide particles of sodium sulfide solution are used up?

04-Core-6C In Chapter 7, you heated the six test tubes with the yellow solid in them. Then you were given the following directions:

> Measure, in millimeters, the height of the yellow solid that has formed in each tube. The height of the pile of solid indicates the amount of product formed. The longer you wait to make the measurements, the more the solid will settle. Therefore, do your measuring today. And measure all the tubes as quickly, yet as carefully as you can.

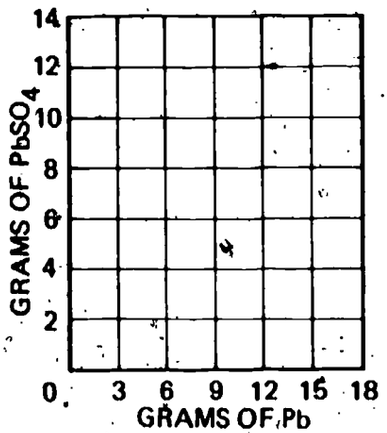
What variable do the directions tell you to control if your results are to be useful?

04-Core-7C Bubbles of carbon dioxide gas were given off when sour milk was added to a solution of baking soda. Carbon dioxide was released in the reaction from particles of baking soda. How could you tell if there were some unreacted baking soda particles remaining after the reaction?

04-Core-8C Larry combined lead and sulfuric acid in the following reaction. His data for six trials appear in the table below.

$Pb + H_2SO_4 \rightarrow PbSO_4 + H_2$

(lead) (sulfuric acid) (lead sulfate) (hydrogen)



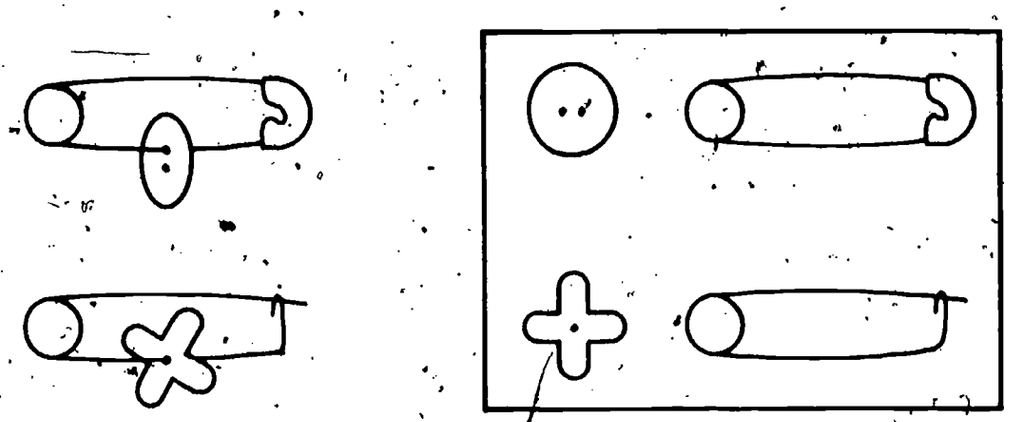
TRIAL	AMT. OF H_2SO_4 (in g)	AMT. OF Pb (in ml)	AMT. OF $PbSO_4$ (in g)
1	35	3	4.5
2	35	6	9.0
3	35	9	11.0
4	35	12	11.0
5	35	15	11.0
6	35	18	11.0

Study the table, and answer the following questions. If it would help you, get a piece of graph paper and plot data on a grid like the one shown above.

1. Which trials show an excess of H_2SO_4?
2. Which trials show an excess of Pb?

04-Core-9C Define the term *compound* as it is used in the following sentence. Potassium nitrate (KNO_3) is a compound.

04-Core-10C



If the combinations shown at the left above represent compounds, what does each symbol in the box at the right represent?

04-Core-11C

Juan developed a model which explained all the known observations about X-rays. When a different model was suggested that was also supposed to explain all known observations, Juan refused to look at it. He said, "It can't be good. It's different from mine, and mine is known to work."

1. Do you agree with Juan's reason for not looking at the other models?
2. Explain your answer.

04-Core-12C

Suppose you suddenly became so small that you could walk among all the atoms in a material. Then you got lost inside the piece of material because all the atoms looked exactly alike. What sort of a material would you be in?

04-Core-13C

Select the best statement below about the models that scientists use.

a. A model used by scientists is thrown out when it does not predict or explain a new observation because it has been shown to be incorrect or incomplete.

b. It is not known if the models used by scientists are correct, but they are used because they help predict and explain observations.

c. The models of science are discarded when they do not agree with new experiments. They cannot be changed.

d. The models of science are based on the laws of nature and are therefore correct.

04-Core-14C

Suppose that a particle model for magnetism is accepted by scientists. This would mean that

a. scientists have direct proof that magnetism exists as particles.

b. at least the best scientists have seen magnetism particles.

c. thinking about magnetism as though it is made up of tiny particles explains most of the observations made to date.

d. magnetism is exactly like matter particles.

e. no other model can explain the observations made to date.

04-Core-15C In Chapter 7, you worked with lead and iodine. In Chapter 8, you worked with copper sulfate ($CuSO_4$) and zinc (Zn). In both chapters, you were asked whether atoms combine with each other in definite numbers. Your answer was yes in both cases. Why were you asked to answer the same question a second time?

04-Core-16C

SYSTEM

Iron	+ silver nitrate	→ iron nitrate	+ silver
(colorless solution)	(colorless solution)	(colorless solution)	(silverish solid)

Write the letters of any of the following which represent a component of the above system.

a. silver + sulfide → silver sulfide
b. iron
c. iron + silver nitrate
d. iron nitrate
e. iron + silver nitrate → iron nitrate + silver

04-Core-17C

SYSTEM

copper	+ nitric acid	→ copper nitrate	+ water	+ nitrogen dioxide
(reddish solid)	(yellowish solution)	(blue solution)		(orange-brown gas)

Write the letters of any of the following which represent subsystems of the above system.

a. copper + nitric acid → copper nitrate + water + nitrogen dioxide
b. copper + nitric acid → nitrogen dioxide
c. copper
d. copper + nitric acid
e. copper nitrate + water + nitrogen dioxide

04-Core-18C Get the following equipment:

1 alcohol burner
1 250-ml beaker
1 Celsius thermometer
1 burner support stand
125 ml of water

Get your teacher or an appointed observer to watch you. Use the alcohol burner to heat 125 ml of water. While the water heats, measure and record its temperature every minute for three minutes.

04-Core-19C Debbie studied a compound of potassium (K) and bromine (Br). She concluded that one atom of K reacted with each atom of Br. Dave said that if Debbie had started with different amounts of K and Br, the number of atoms of K that combined with each atom of Br would have been quite different.

1. Do you agree with Debbie or Dave?
2. Why?

Ask your teacher to have someone observe you for this performance check. Get bottle 04-Core-20, and weigh out 2 grams of the white solid it contains. You may use any equipment you need. **04-Core-20C**

In box 04-Core-21, you will find eight solutions labeled A through H. Get five test tubes and any equipment you need. Mix the solutions as shown in the table below. For each numbered mixture, (a) tell whether or not a reaction takes place and (b) if there is a reaction, state the evidence for it. **04-Core-21C**

MIXTURE	½ DROPPER + ½ DROPPER	
1	H	B
2	D	H
3	E	C
4	H	G
5	F	A

For each situation below: **04-Core-22C**

(a) state whether a reaction has occurred or not and
(b) if it has, state the evidence of the reaction.

Situation 1: Two colorless solutions are mixed. No color change is observed in the resulting solution, and no gas is released. The test tube gets hot, and a white solid settles to the bottom of the beaker.

Situation 2: Two white solids form colorless solutions when dissolved in water. When the two solutions are mixed, the resulting solution remains clear and colorless. No gas is given off, and the temperature doesn't change. No solid settles to the bottom.

Situation 3: Two colorless solutions are mixed. A colorless gas is given off, the resulting solution is colorless, and no solid is formed.

Situation 4: When one clear, colorless solution is added to another colorless solution, the glass container in which they are mixed grows very warm. No gas is released, the solution stays clear and colorless, and no odor is observed.

Examine the table below which shows the data collected in three trials. **04-Core-23C**

TRIAL	MASS OF BLUE REACTANT	MASS OF PURPLE REACTANT	MASS OF PRODUCT
1	6 g	87 g	8 g
2	6 g	117 g	8 g
3	6 g	132 g	8 g

Notice that in each trial the amount of the purple reactant changes. Yet the amounts of the product is exactly 8 g in each case. Explain why.

04-Core-24C If l is the symbol for length and you were asked to measure Δ l, what would you measure?

04-Core-25C Milk of magnesia and vinegar reacted in a beaker. The temperature of the reacting mixture increased 4°C. How could you tell if there are any particles of milk of magnesia that are still unreacted?

04-Core-26C Brad has three beakers labeled 1, 2, and 3, each of which contains both the elements iron (Fe) and sulfur (S). He analyzed the same amounts of material from the top and the bottom of each of the beakers. His analyses are shown in the data table below.

BEAKER NUMBER	ATOMS OF Fe	ATOMS OF S
1 (top)	40	60
1 (bottom)	40	60
2 (top)	40	30
2 (bottom)	40	20
3 (top)	40	20
3 (bottom)	40	30

1. In which, if any, of the three beakers were Fe and S present as a single compound?
2. How do you know?

04-Core-27C Read the equation below.

$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$

(lead nitrate) (potassium iodide) (lead iodide) (potassium nitrate)

1. How many iodide (I) atoms are present in the reactants?
2. How many atoms of oxygen (O) are present in the products?

04-Core-28C Mark mixed an orange solution containing particles 1 and 2 with a blue solution containing particles X and Y. This resulted in a colorless solution and a yellow solid. What happened to the particles during the reaction to cause these changes?

04-Core-29C

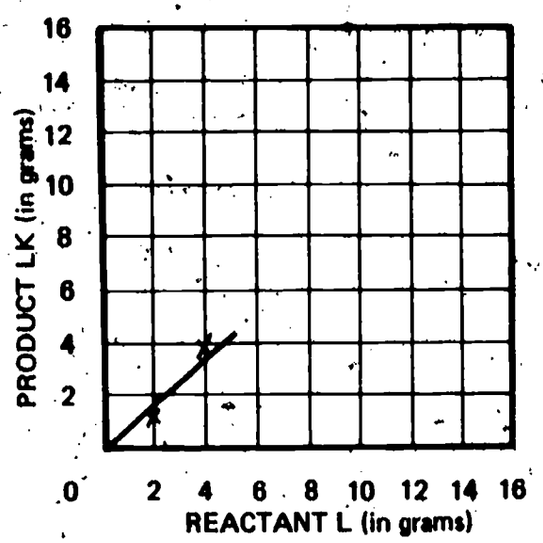
1. Is the reaction below possible?
2. Explain your answer.

$PbI_2 + CuSO_4 \rightarrow K_2SO_4 + CuCl_2$

(lead iodide) (copper sulfate) (potassium sulfate) (copper chloride)

04-Exc 7-1-1C Suppose that you were given the following graph and asked to predict the amount of product LK formed when 7 g and 13 g of reactant L were reacted with a set amount of K.

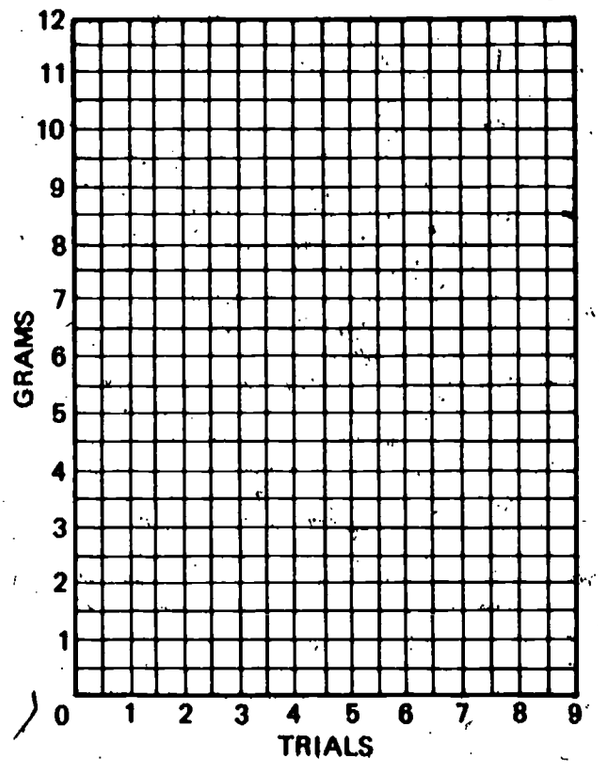
1. Which, if either, of the two predicted values would you be less sure of?
2. Why?



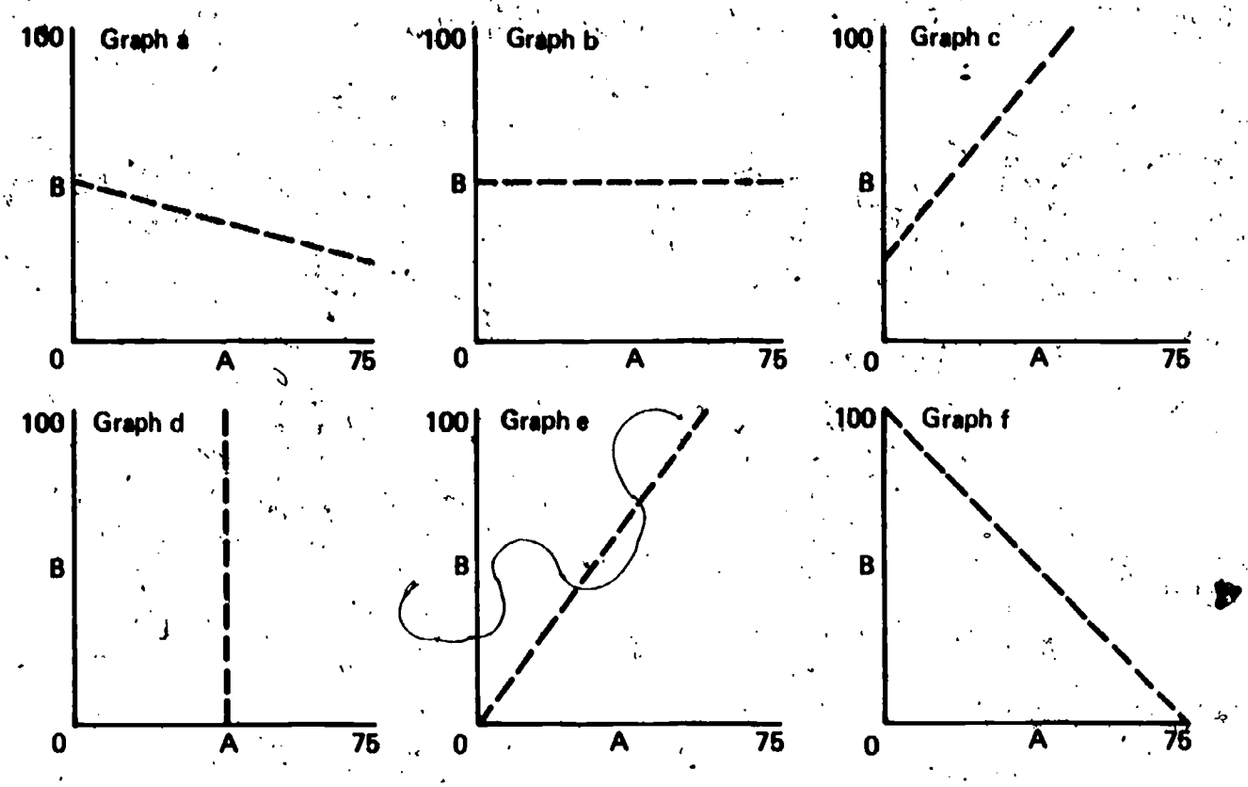
Get a piece of graph paper and label it like the grid shown below. Plot the data. Draw in the best-fit lines for the data.

04-Exc 7-1-2C

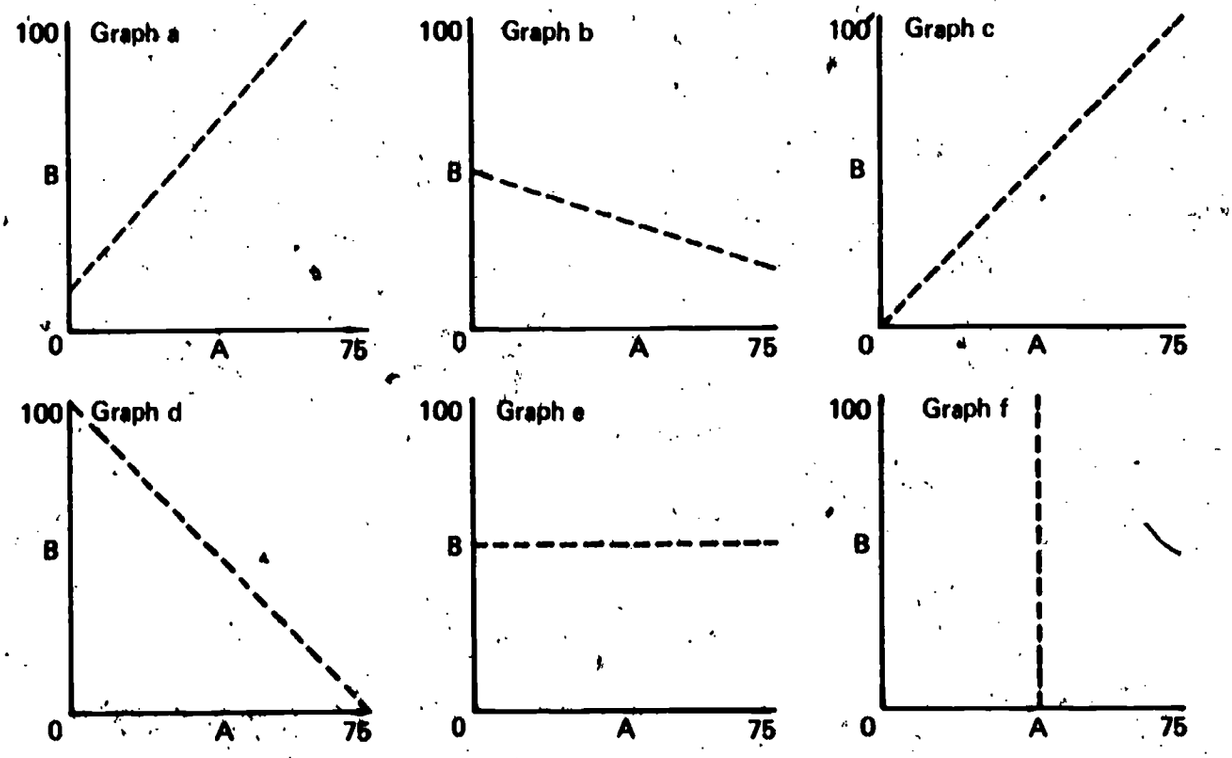
TRIAL	g OF NICKEL
1	2.7
2	5.0
3	7.3
4	8.4
5	8.2
6	8.6



04-Exc 7-1-3C List the letters of any graphs which tell you that when A increases, B also increases.

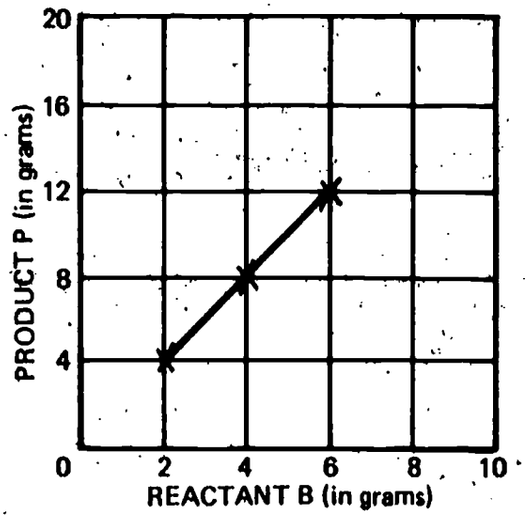


04-Exc 7-1-4C Write the letters of any graphs which show one variable which stays the same while the other increases.



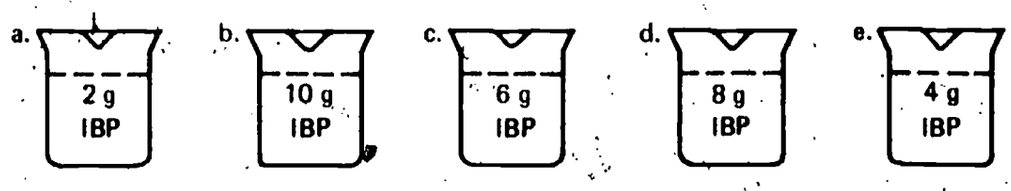
From the graph, predict how many g of product P would be formed if **04-Exc 7-1-5C**

1. 5 g of reactant B were used.
2. 3 g of reactant B were used.
3. 10 g of reactant B were used.
4. 1 g of reactant B were used.



Lucy put 80 ml of milk into each of the five beakers shown below. Then in each beaker she dissolved the different amounts of instant breakfast powder (IBP) shown. **04-Exc 7-2-1C**

1. Starting with the least concentrated solution, list the solutions in order of concentration.
2. Which is the more concentrated solution, c or e?



In 300 ml of a chocolate syrup solution, there are 180 g of sugar. What is the concentration of sugar in the solution? State your answer in grams per milliliter (g/ml). **04-Exc 7-2-2C**

A 500 ml bottle of cherry syrup solution contains 200 g of sugar. At the end of the day, 100 ml remains in the bottle. How many grams of sugar are in the bottle? **04-Exc 7-2-3C**

Get the following equipment. **04-Exc 8-1-1C**

1 250-ml beaker
1 Celsius thermometer
water

Get your teacher or an appointed observer to watch you. Measure and record the temperature of the water.

04-Exc 8-2-1C John mixed two solutions to perform the following reaction:

lead nitrate + sodium carbonate → lead carbonate
(solution) (solution) (solid)

Lead carbonate is a white solid which settles to the bottom of the solution. John said there should be another product, sodium nitrate.

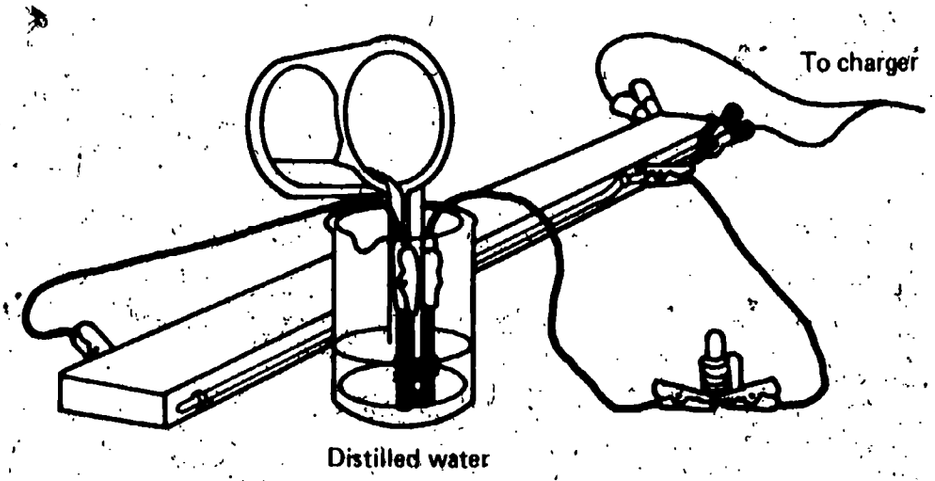
1. If John is right, where is that product?
2. How could you get it?

04-Exc 8-3-1C Nitrate (NO_3) is an atom team. If silver nitrate ($AgNO_3$) reacts with sodium chloride (NaCl), which of the following would be a product of the reaction?

a. $NaNO_3$
b. $NaNO_2$
c. $NaNO_4$
d. Na_2O
e. Na_3N

Recently you tried to find out if a copper sulfate ($CuSO_4$) solution would conduct a current. First you put distilled water into the beaker and tested it to see if it would conduct electricity, as shown below. Then you dissolved solid $CuSO_4$ in the water to make a solution which you then tested. Why didn't you put a solution of $CuSO_4$ into the beaker in the beginning and skip the step using only distilled water?

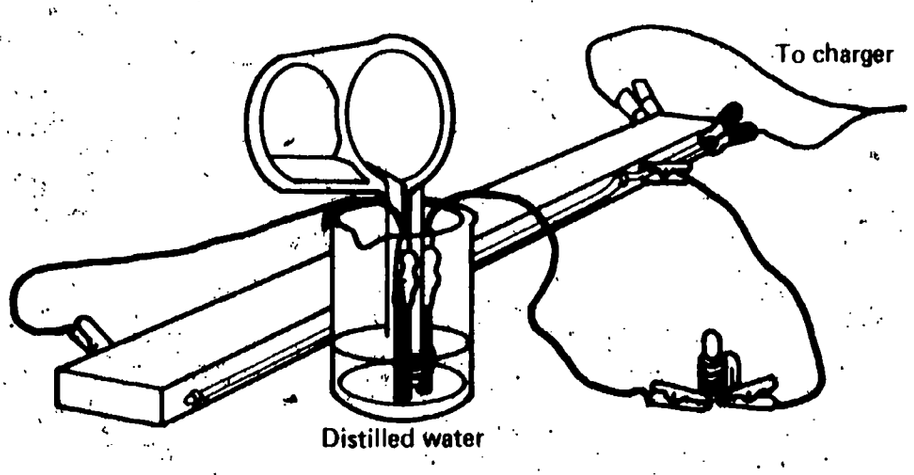
05-Core-1C



In an activity, you were asked to determine if copper sulfate ($CuSO_4$) in a solution would conduct electricity. First you tested distilled water to see if it would conduct electricity, as shown below. Then, you made the test with a solution of $CuSO_4$ and water. When something is used the way distilled water is used in this activity, it is called

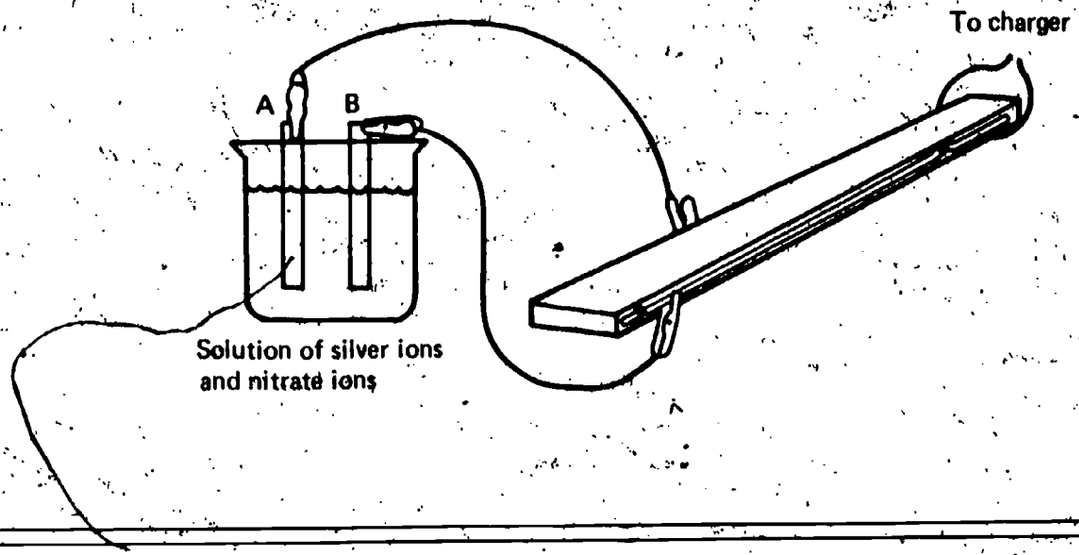
05-Core-2C

a. a system.
b. an element.
c. a control.
d. a compound.



05-Core-3C

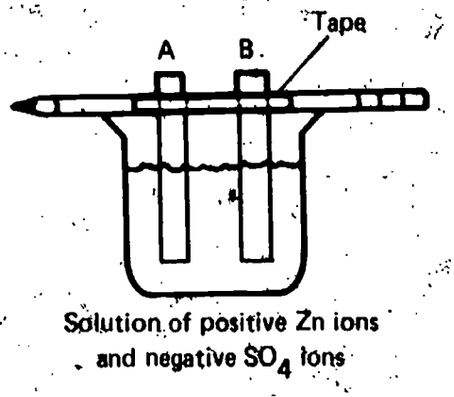
Don hooked up his apparatus, as shown below. Rod A was positive and attracted nitrate ions. Rod B was negative and attracted silver ions. Don was called out of the room, so he disconnected the rods. When he reconnected the rods, he mixed up the leads and B became positive and A negative. How would this affect the ion flow in the solution?



05-Core-4C

Al put two carbon rods into a zinc sulfate ($ZnSO_4$) solution, exactly as shown below. He wanted the zinc (Zn) ions to move to carbon rod A. He left the equipment in place overnight so that the zinc ions would have time to move.

1. When Al comes to school in the morning, will the zinc ions have moved to carbon rod A?
2. Explain your answer.



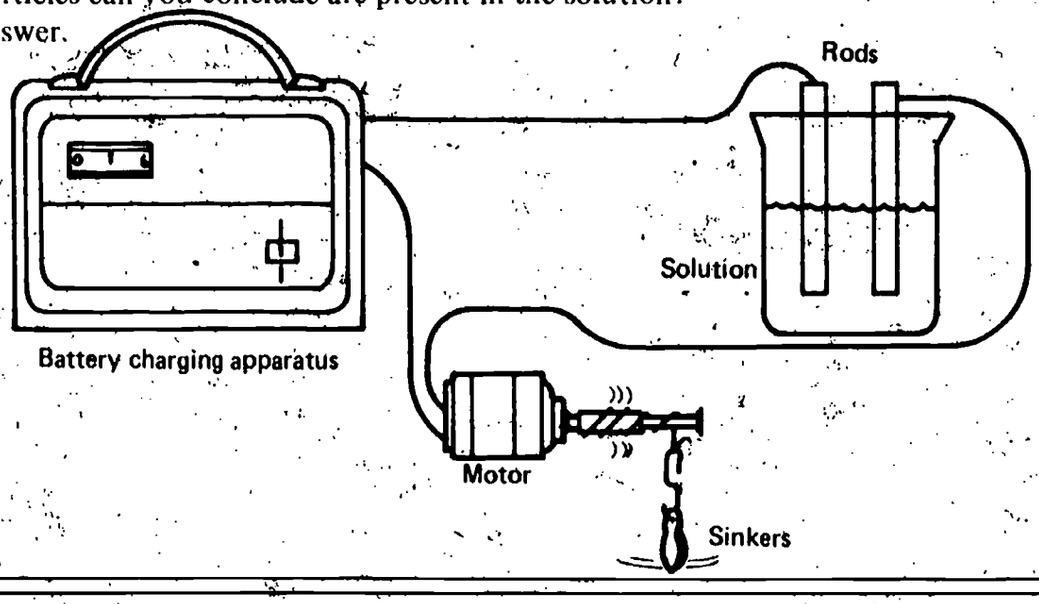
05-Core-5C

Select the phrase which best completes the following story. Jan was polishing the plastic top on a coffee table with a light, soft cloth. As she polished, she noticed that the cloth began to stick to the plastic. The polishing must have

a. removed any charges on the cloth and the table.
b. caused the cloth and the table to be oppositely charged.
c. produced the same charges on the cloth and the table.
d. either a or c.

Study the diagram. When the circuit is set up, the motor lifts the sinkers. **05-Core-6C**

1. What kind of particles can you conclude are present in the solution?
2. Explain your answer.

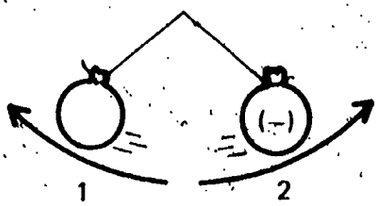


Ben Franklin found that there were two types of electrical charge. What are they called? **05-Core-7C**

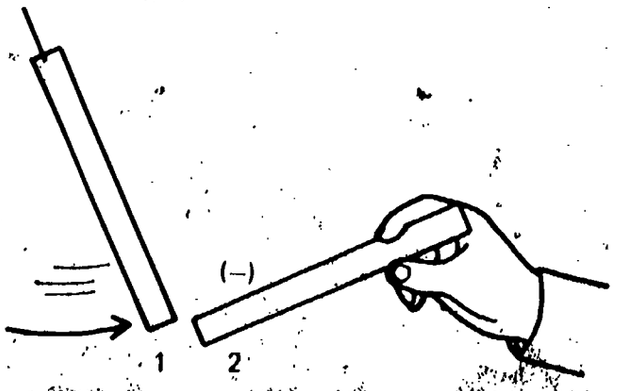
State the rule which describes what would happen if objects with like charges or objects with opposite charges are brought near to each other. **05-Core-8C**

The balloons in the diagram below are repelling each other. Balloon 2 has a negative charge. **05-Core-9C**

1. What is the charge on balloon number 1?
2. State the rule on which you based your answer.



The two rubber rods in the diagram attract each other. Rubber rod 2 has a negative charge. What is the charge on rubber rod 1? **05-Core-10C**



05-Core-11C Two Ping-Pong balls are each given a charge. How can you determine if the charges on the two objects are the same or different?

05-Core-12C Lois put a positively charged rod and a negatively charged rod into a solution. The solution contained zinc ions, which were positively charged.

1. Would the zinc ions move towards or away from the negatively charged rod?
2. Why?

05-Core-13C Get bottles 2, 4, and 6 from box 05-Core-13. Also get three test tubes. In separate test tubes, put about 3 ml of each solution. Decide what you need to do to find out if the sulfate ion is present in any of these solutions. Check your plan with your teacher. If it is all right to go on, get what you need and test the solutions. Record the bottle number of any solution which contains sulfate ions.

05-Core-14C You operationally defined the sulfate ion. What do such operational definitions of substances tell you?

05-Core-15C When you dissolved lead nitrate, you released nitrate (NO_3) ions into the solution.

1. Is the NO_3 ion made up of just one element?
2. If so, what is it? If not, how many elements are in the ion?

05-Core-16C Potassium sulfate (K_2SO_4) and copper nitrate [$Cu(NO_3)_2$] are compounds. According to the model you are developing, what force holds the atoms in each of these compounds together?

05-Core-17C Mark found that the ions below had the charges shown. The plus sign represents a positive charge, the minus sign a negative charge.

Na^+, Br^-, Ag^+, Li^+, Cl^-, F^-

Based on your experience, predict three pairs of two ions each that could combine to form compounds.

05-Core-18C

1. Select any pair or pairs of ions in which the paired ions would attract each other.
   a. Cl^-, Ag^+
   b. Na^+, I^-
   c. Ag^+, Na^+
   d. Cl^-, I^-
2. Tell why you chose as you did.

KEY	
+	Positive ion
-	Negative ion

05-Core-19C Dale found that there were only two kinds of particles present in a white compound. One of these was a chloride ion, which had a negative charge. The other was a magnesium particle.

1. Which kind of charge would the magnesium particles have?
2. Explain why you predicted the charge you did.

Iggy and the textbook asked you to record your observations and to label many things. There is a reason you are asked to write down so much. The reason is that **05-Core-20C**

a. in this course you are a scientist. Historians don't have to be so careful.
b. you aren't a scientist yet, so you still tend to forget.
c. this stops you from making mistakes.
d. it is a helpful procedure for any investigation.

Textbooks I and II were written for students like you. Both books discuss the results of passing an electric current through a solution of copper chloride. **05-Core-21C**

Textbook I then says:

> The tiny copper and chloride ions do move toward the charged rods. The movement of the copper and chloride ions proves that matter is held together by differently charged particles.

Textbook II says:

> A particle model of matter assumes that ions of copper are very tiny. Therefore, they could move, and you wouldn't see them. This model is useful and may be used for other substances as long as it is supported by your observations. To apply it to other substances, you will need more data.

Pick the answer below which states both which of the books a scientist probably would prefer and why he would prefer it.

a. Book I, because these are all facts which were proved in class.
b. Book II, because it involves a model.
c. Book I, because it states more facts than Book II.
d. Book II, because it says that the data supports the conclusion but experimenting must continue.
e. Either book, because both talk about the same thing.

Assume that Dr. Betty Green is a noted scientist who is well accepted by other scientists. She said, "I think that virus X is the cause of the common cold." Other scientists would accept Dr. Green's statement if she **05-Core-22C**

a. put it into a textbook she was writing.
b. reported injecting some volunteers with the virus; others were not injected.
c. produced a pure sample of the virus which she claimed caused the colds.
d. found 100 people who thought she was right.

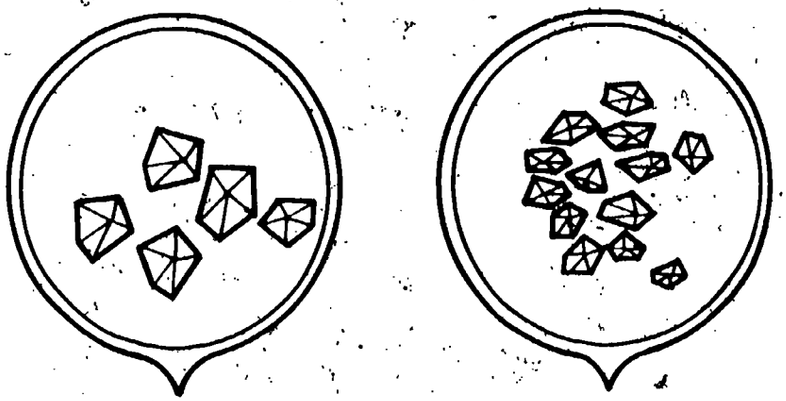
In Chapter 10, the text discussed matter particles called *ions*. Which of the following statements best describes ions? **05-Core-23C**

a. The idea of ions was thought up by scientists to explain the behavior of some matter particles.
b. The ISCS experiments prove that ions exist.
c. All ions can be identified by their color.
d. $CuSO_4$ and $CoSO_4$ were both composed of ions; therefore, all matter is made up of ions.

05-Exc 9-1-1C Suppose you shrank to the size of a matter particle. If you wanted to ride Iggy's Ion Express to the village of Positive Rod, what would you be charged?

05-Exc 10-1-1C Last month, Bert left beakers A and B of the same solution in two different places in the classroom. Sue just found the beakers. The solutions had evaporated, leaving crystals which look like those in the diagram below.

1. Which of the beakers of solution evaporated faster?
2. Explain your answer.



Beaker A
Yellow crystals

Beaker B
Yellow crystals

05-Exc 10-2-1C Open your textbook to Table 1 on page 472.

Glen filled in the table with the following data, working with a setup like the one shown on page 473, but using iron metal strips and iron nitrate solution.

	NEGATIVE STRIP	POSITIVE STRIP
Initial pointer position	4.8 cm	4.8 cm
Final pointer position	5.3 cm	3.9 cm
Change in position	down 0.5 cm	up 0.9 cm
Observations	iron crystals forming	

On your answer sheet, explain the data above. Use a labeled diagram to illustrate your explanation.

Not long ago you put some sodium sulfate solution into a beaker to find out if it conducted electricity. You didn't add any other chemicals to the solution, yet you put it into a "used" jar when you finished. Why couldn't you have put the solution back into the bottle you got it from? **06-Core-1C**

Noreen placed a negatively and a positively charged rod, both connected to a battery charger, into a solution. She knew that the solution contained particles of an element. Neither of the charged rods attracted the particles of the element. Which of the following kinds of particles of the element are in the solution? **06-Core-2C**

a. Ions
b. Atoms
c. Either a or b
d. None of the above

Leonard put two carbon rods, which were connected to a battery charger, into a solution of sodium iodide. The iodide ions moved toward the rod with the positive charge. What was the charge on the iodide ions? **06-Core-3C**

Sharon found that if she slid her uncharged nylon ski-jacket on over an uncharged wool sweater, both became charged. Explain what happens to cause two neutral objects like the sweater and jacket to become charged by being rubbed over each other. **06-Core-4C**

Art wiped the dust off of his TV screen. Both the glass and the dust cloth became charged. **06-Core-5C**

1. If he brought the cloth near the screen again, would the screen and the cloth attract or repel each other?
2. Why?

Write the letter of the best answer in each of the following cases. **06-Core-6C**

Case 1. If a wool rug is positively charged, it has
a. no negative charges.
b. fewer negative charges than positive charges.
c. the same number of negative and positive charges.
d. just positive charges.

Case 2. If a plastic table top is negatively charged, it has
a. no positive charges
b. just negative charges.
c. equal numbers of negative and positive charges.
d. more negative charges than positive charges.

Sharon found that a neutral plastic table top and a neutral cotton dust cloth became oppositely charged when they were rubbed together. Explain how opposite charges were produced by rubbing objects which had been neutrally charged. **06-Core-7C**

06-Core-8C Record the letter of the phrase below which correctly completes the sentence. All neutral objects have

a. no positive or negative charges.
b. equal numbers of positive and negative charges.
c. fewer negative than positive charges.
d. more negative than positive charges.

06-Core-9C Sandy put bits of paper on the top of her desk. She found that the bits of paper were attracted to two strips, one a vinyl strip with a positive charge and the other an acetate strip with a negative charge. What was the charge on the bits of paper?

06-Core-10C Sue had a neutrally charged Ping-Pong ball on a string. She brought a positively charged rubber rod to the ball, and the rod attracted the ball for a moment. Then they repelled each other and continued to repel. Explain why they first attracted and then repelled each other.

06-Core-11C State an operational definition for *neutrally charged particle of a powder.*

06-Core-12C Gene found a white powder in a storage case. Suppose he asked you to find out if the powder contained ions, one kind of atom, or one kind of molecule. Select any of the following which you would need to know to determine the kinds of particles in the material.

a. If the substance can be broken down into two or more simpler substances
b. If its powder is attracted to a negatively charged vinyl strip
c. If a solution of the substance will conduct electricity
d. The size and shape of the original substance
e. The amount of the substance which will dissolve in water

06-Core-13C Dr. Green found a procedure for breaking down large protein molecules into smaller units. Which of the following is a possible product of such a breakdown?

a. Atoms
b. Elements
c. Smaller molecules
d. Other compounds (combinations of different atoms)
e. All of these

06-Core-14C Eric crushed an aspirin and found that the aspirin powder was attracted to both a glass rod and a rubber rod which were oppositely charged. This led him to conclude that aspirin must be made up of molecules, not ions.

1. Do you agree or disagree with Eric?
2. Why?

One atom of carbon, one atom of oxygen, and two atoms of hydrogen make up one molecule of formic acid. It requires a force to break up that molecule once it is formed. **06-Core-15C**

1. What force holds the neutral molecule together?
2. Explain how this force can exist in a neutral molecule.

Quicklime is a substance which is made up of atoms of calcium and oxygen combined in definite numbers. What are such substances called? **06-Core-16C**

Neutral atoms of barium lose a negative charge to atoms of sulfur. The barium atoms then become barium particles with a charge. What do scientists call such atoms with a charge? **06-Core-17C**

Alcohol is made up of molecules. Write the letter of any of the following which are true statements about alcohol. **06-Core-18C**

a. It contains no positive or negative charges.
b. Its solution will not conduct electricity.
c. The substance contains both positive and negative charges.
d. It does contain ions.
e. It is a neutral particle.

Select the statement below which is part of the atomic model. **06-Core-19C**

a. All atoms are the same color.
b. Matter contains movable negative charges.
c. Matter contains no positive or negative charge.
d. All matter contains unequal amounts of positive and negative charge.

Read the following statement carefully. The particle model for matter you have been developing is incomplete. You are working toward the completed model which has already been developed by scientists. **06-Core-20C**

1. Do you agree or disagree with this statement?
2. Why?

Suppose that a particle model for magnetism had been accepted by scientists. This would mean that **06-Core-21C**

a. scientists had direct proof that magnetism exists as particles.
b. at least a few good scientists had seen particles of magnetism with their own eyes.
c. magnetism is exactly like matter particles.
d. thinking about magnetism as though it were made of tiny particles explained most of the observations made up to that time.
e. no other model could explain the observations made up to that time.

06-Core-22C The atom, a particle of an element, is a model now being used to explain matter. Scientists accepted the atomic model

a. only when atoms were finally seen by scientists.
b. only when it didn't cause a change in other models of science.
c. when thinking about matter as tiny particles proved to be useful.
d. only when no other model could describe matter and its reactions.

06-Core-23C If you are considering the concept of electrical charge, one of the terms below doesn't belong with the rest. Record the letter of that term.

a. Ion
b. Molecule
c. Atom
d. Neutral particle

06-Core-24C Beside the number of each statement, write on your answer sheet the word *atom* for the statements that are true of atoms. Write the word *ion* for the statements that are true of ions. Write the word *both* for statements true of both atoms and ions.

1. They are present in a piece of zinc.
2. They can be colored.
3. They can be particles with more positive charges than negative.
4. They are responsible for conducting current in a solution.
5. They can be particles with an excess of negative charges.

06-Core-25C Linda examined three powders and found that they were all attracted both to positively and to negatively charged acetate strips. She then dissolved each powder in a different beaker of water and found that each of the solutions conducted electricity. Study the chart of her data below.

COLOR OF SUBSTANCE	CONDUCTS ELECTRICITY	ATTRACTED TO POSITIVE CHARGE	ATTRACTED TO NEGATIVE CHARGE
Orange	yes	yes	yes
Pink	yes	yes	yes
Purple	yes	yes	yes

Based on these data, what can you conclude about the substances? Select the statement below which correctly describes the substances.

a. They are ionic, and each substance contains equal amounts of positive and negative charges.
b. They are ionic, and each substance contains unequal amounts of positive and negative charges.
c. They are molecular, and each substance contains equal amounts of positive and negative charges.
d. They are molecular, and each substance contains unequal amounts of positive and negative charges.

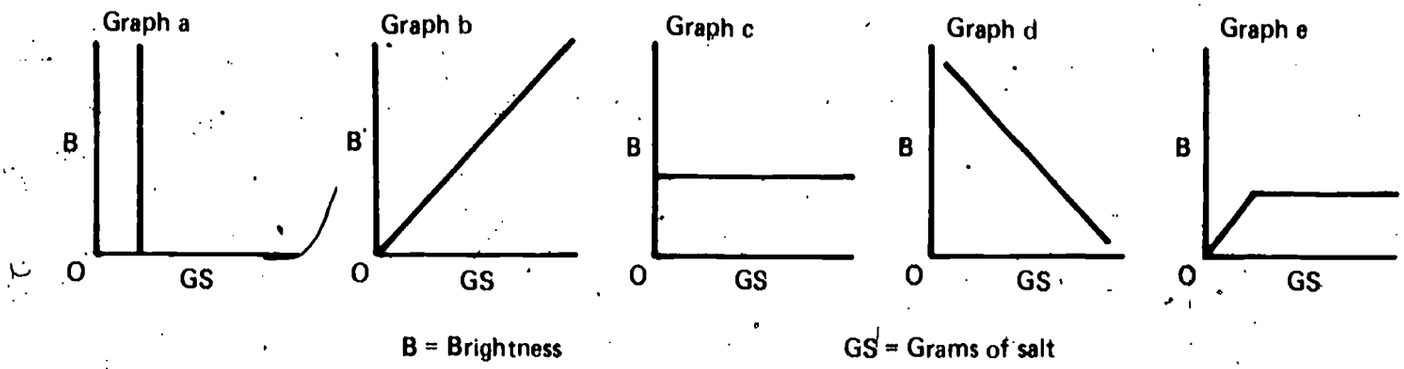
Water was once thought to be an element. **06-Exc 11-1-1C**

1. Is it?
2. Explain your answer.

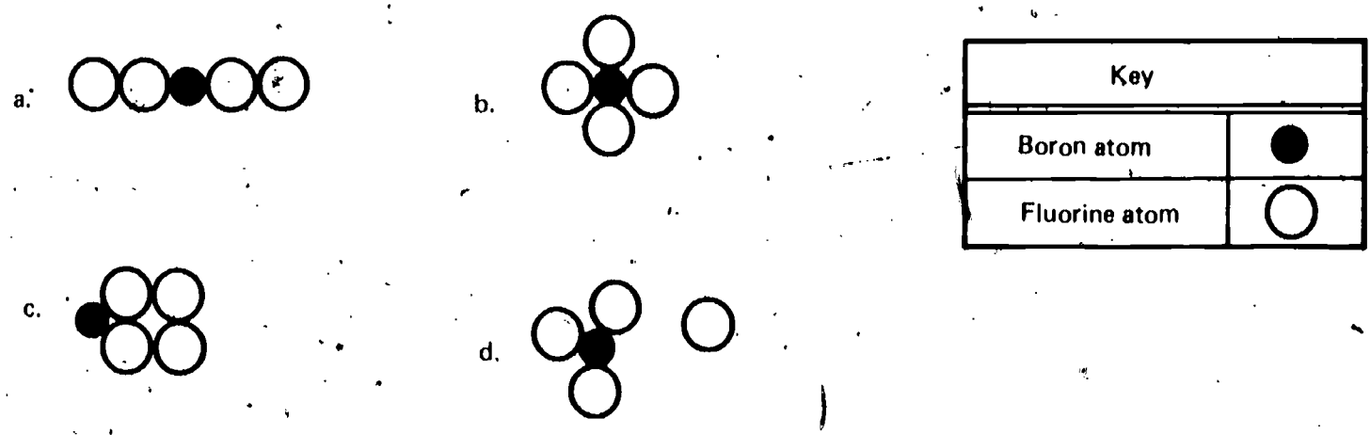
Sue used a shortcut when she did the excursion "Strip Affects Drip." Instead of using both a positively charged acetate strip and a negatively charged vinyl strip, she used just a positively charged acetate strip. The stream of drips was attracted to the positively charged acetate. She concluded that the drips were neutral. **06-Exc 11-2-1C**

1. Was this a wise conclusion?
2. Explain your answer.

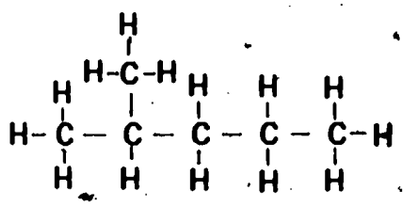
You may look at your book and notes for this question. If in Excursion 11-3, "Electrolytes Light," you were to draw a graph of your data, which of the graphs below best represents the general shape you would find? **06-Exc 11-3-1C**



Suppose you had one boron atom and four fluorine atoms. If boron atoms have a combining power of 3 and fluorine atoms have a combining power of 1, which of the following diagrams shows the most likely combination of these five atoms? **06-Exc 12-1-1C**



06-Exc 12-1-2C Draw a structural formula for an isomer of the 6-carbon molecule shown below.



06-Exc 12-1-3C Delia and Sarah both have white powders. They claim that the powders have the same chemical formula, $C_4H_4O_4$. Each tests her powder and reports the following results.

	DELIA'S POWDER	SARAH'S POWDER
Melting point °C	83	139
Boiling point °C	150	280

They repeat their tests several times to check their results.

1. Is it possible that both compounds really have the same formula?
2. Explain your answer.

Several things can change the reaction rate between two chemicals. What does *reaction rate* mean as it is used in the sentence above? **07-Core-1C**

Mrs. Nelson wants to find out the concentration of the lye in an oven-cleaning solution. Select any of the following things she needs to know. **07-Core-2C**

a. The total number of atoms in the solution
b. The name of the liquid in the solution
c. The volume of the solution
d. The solubility of lye
e. The mass of the dissolved lye

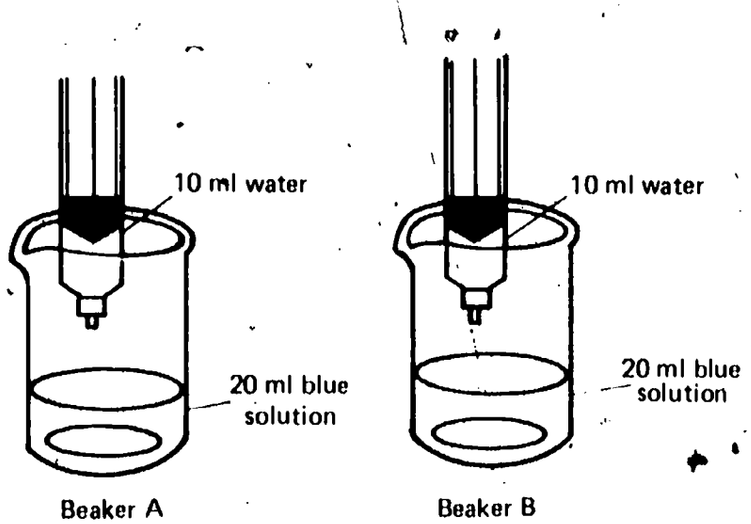
Define *concentration* as it is used in the following sentence. The concentration of the salt solution was very low. **07-Core-3C**

Tom mixed two solutions and made the following observations. Which of his observations are ways of stating the rate of a reaction? **07-Core-4C**

a. Two cc of the product weighed 7 grams.
b. In 10 seconds, 3 grams formed and the reaction stopped.
c. The first solid began to form three minutes after mixing.
d. The mixed solutions turned orange in 0.5 seconds.
e. The total volume of the reaction was 28 ml.

Joe pours 20 ml of a blue solution into beaker A and 20 ml of the same solution into beaker B. He then adds 10 ml of water to each beaker. **07-Core-5C**

1. How do the concentrations of the solutions in beakers A and B compare with each other?
2. Explain your answer.



07-Core-6C

BABY-FOOD JAR	VOLUME OF $Pb(NO_3)_2$ SAMPLE (in ml)	VOLUME OF WATER ADDED (in ml)	TOTAL VOLUME OF FINAL SOLUTION (in ml)
A	15	35	50
B	10	40	50
C	50	0	50
D	25	25	50
E	30	20	50

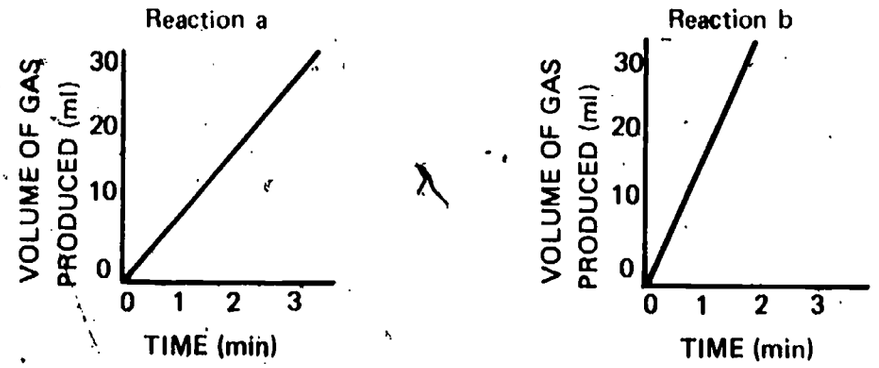
All the lead nitrate [$Pb(NO_3)_2$] samples were taken from the same bottle and diluted with the volume of water recorded in the table above. Place the numbers 1 through 5 on your paper. Using the concentrations listed below and the beaker letters from the table, match each final solution described in the table with the proper statement of its concentration.

1. Most concentrated
2. Second most concentrated
3. Third most concentrated
4. Fourth most concentrated
5. Least concentrated

07-Core-7C

The graphs below show the results of two reactions of the same chemical system. The reactants in the system are sodium hydroxide (NaOH) and a colorless solution. One of the products is a gas. A different amount of NaOH is used in each reaction, but the amount of the colorless solution is the same in both reactions.

1. In which reaction is the greater amount of NaOH used?
2. How do you know?



07-Core-8C

Reaction A: 5 ml vinegar + 30 ml water + 500 ml milk → sour milk
Reaction B: 5 ml vinegar + 10 ml water + 500 ml milk → sour milk

1. Would both of the reactions above have the same reaction rates?
2. If so, explain why. If not, name the variable that accounts for the difference.

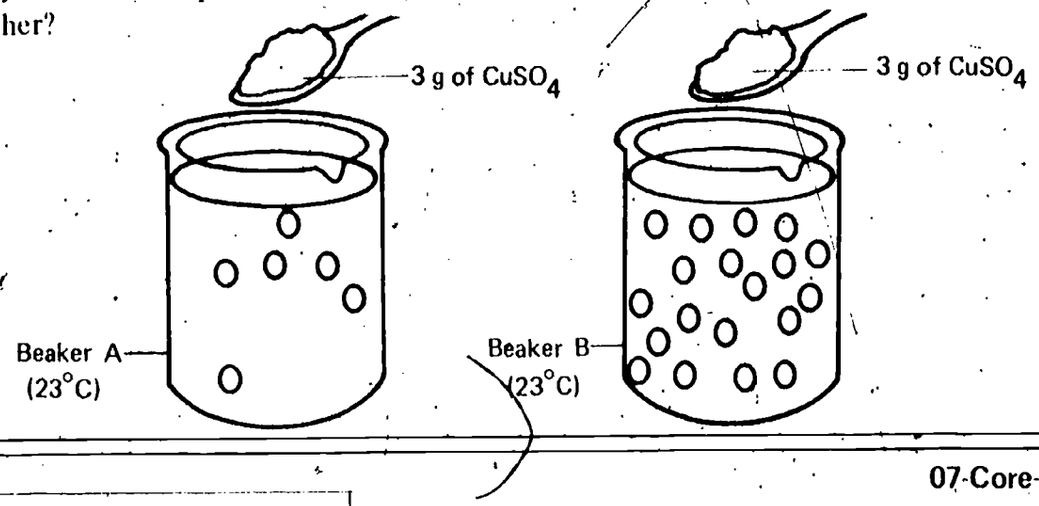
07-Core-9C

Reaction A: 3 ml lemon juice + 7 ml water + 600 ml milk → sour milk
Reaction B: 6 ml lemon juice + 4 ml water + 600 ml milk → sour milk

1. Would both of the reactions above have the same reaction rates?
2. Explain the two reasons for your answer in terms of particle collisions.

07-Core-10C

Both beakers shown below contain particles of dissolved reactant O. Three grams of copper sulfate ($CuSO_4$) are added to each of the beakers, A and B. Reactions take place in both beakers, but the reaction rates in the two beakers are different. In terms of particles, how would your model explain that the reaction rate will be faster in one beaker than in the other?



07-Core-11C

STATE	PARTICLE SPEED
Solid	slowest
Liquid	medium
Gas	fastest

The table above is based on your particle model.

1. On the basis of its information, which of the reactions below would have the greatest reaction rate? (Si stands for silicon and O for oxygen.)
   a. $Si\ (solid) + O_2\ (gas) \rightarrow SiO_2\ (solid)$
   b. $Si\ (gas) + O_2\ (gas) \rightarrow SiO_2\ (solid)$
   c. $Si\ (liquid) + O_2\ (gas) \rightarrow SiO_2\ (solid)$
2. Explain your answer in terms of the particle model.

07-Core-12C

When water for tea is heated, certain changes occur in it. On your paper, list the number of each variable below. Based on your particle model and your experience, indicate how each variable responds to heating by writing *increases*, *decreases*, or *remains the same* after the number of each variable.

1. Volume
2. Number of particles
3. Kinetic energy of particles
4. Particle size
5. Rate of particle collision
6. Particle speed

07-Core-13C

Carl poured two samples of 15 ml of copper chloride ($CuCl_2$) into two jars. The samples were of the same concentrations, but one of the samples was at 15°C and the other was at 27°C. He added an iron nail to each $CuCl_2$ sample. The warmer sample reacted faster. Use your model to explain how temperature differences cause the reaction rates of two reactions to be different.

07-Core-14C

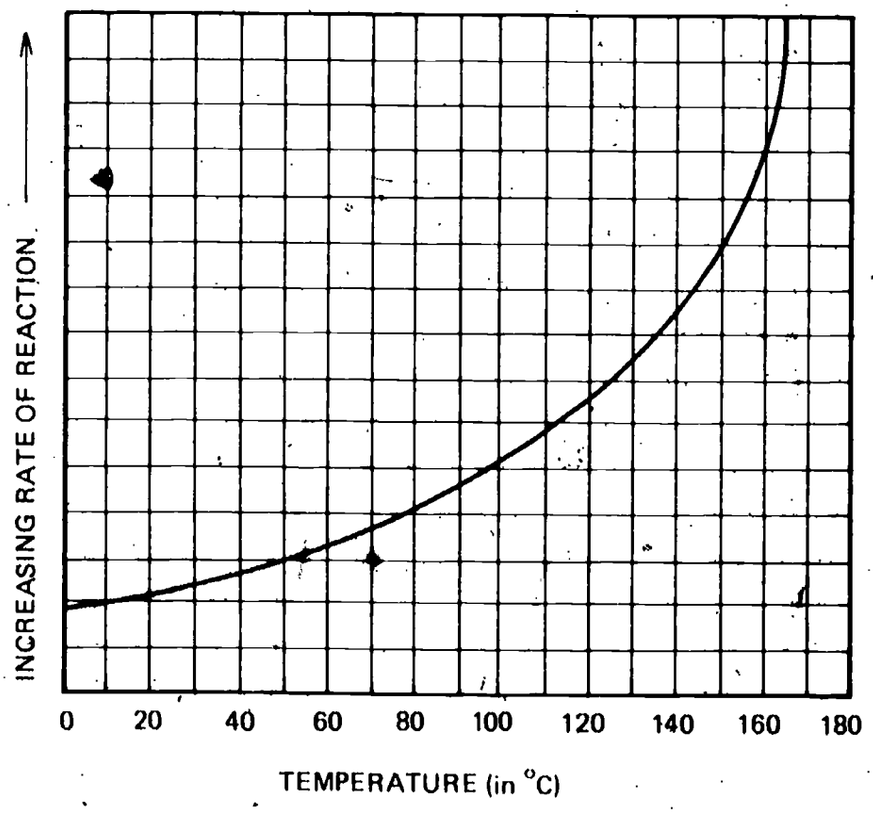
TRIAL	TEMPERATURE	REACTION	RATE
1	15°C	10 g butter sours	1 week
2	?	10 g butter sours	1 month

1. What can you tell about the temperature of trial 2 as compared to that of trial 1?
2. How can you tell?

07-Core-15C

According to the graph below, which of the following temperature intervals produces the greatest change in reaction rate? Select the letter of the correct answer.

a. 0° to 40°C
b. 40° to 80°C
c. 80° to 120°C
d. 120° to 160° C



Nancy collected the data shown in the table. 07-Core-16C

TRIAL	CONCENTRATION	TEMPERATURE	CATALYST
X	5 ml KI + 10 ml $K_2S_2O_8$ + 3 ml water	27°C	none
Y	5 ml KI + 10 ml $K_2S_2O_8$ + 7 ml water	34°C	none

Trials X and Y have the same reaction rates.

1. Are the collision rates in X and Y the same?
2. Explain your answer in terms of your particle model.

You worked with a catalyst in Chapter 15. Give an operational definition for the word *catalyst* which includes all the characteristics of a catalyst. 07-Core-17C

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1. Consider the two trials of the reaction below. 07-Core-18C

Trial A.

A 13 ml sample of hydrogen peroxide (H_2O_2) is heated gently. The reaction gives off 3 ml of oxygen in 10 seconds.

Trial B.

A 13 ml sample of H_2O_2 is heated with a little platinum. This gives off 23 ml of oxygen in 10 seconds. The platinum is unchanged.

Is platinum a catalyst for the reaction?

2. Consider the two trials of the reaction below.

Trial A.

A 10 ml sample of sour milk and 12 g of baking soda react to produce 15 ml of carbon dioxide (CO_2) in one minute.

Trial B.

A little window cleaner is added to the 10 ml of sour milk and 12 g of baking soda. Only 5 ml of CO_2 are produced in one minute.

Is window cleaner a catalyst for the reaction?

Trial A.

A 12 g sample of baking soda is heated. The reaction produces 8.5 ml of CO_2 in one minute.

Trial B.

A 12 g sample of baking soda is heated with a little copper carbonate (yellow). The reaction produces 9.0 ml of CO_2 in one minute, and the yellow crystals turn black.

Is copper carbonate a catalyst for the reaction?

Dennis wanted to find out if salt is a catalyst for the reaction between potassium permanganate ($KMnO_4$) and oxalic acid ($H_2C_2O_4$). Design a procedure to find out. The rate of the $KMnO_4$-$H_2C_2O_4$ reaction is indicated by the time it takes the $KMnO_4$ to change color. Include statements of (1) which variables should be kept constant (HINT: What things cause a reaction rate to change?) and (2) which variables should be varied. Also (3) include a test to show if salt reacts or causes the reaction. 07-Core-19C

07-Core-20C

Matt heard that iron oxide was a catalyst for the reaction between zinc (Zn) and copper sulfate ($CuSO_4$). To three test tubes in which Zn and $CuSO_4$ were reacting, he added ¼ teaspoon of iron oxide to one, ½ teaspoon to the second, and 1 teaspoon to the third. The reaction rate did not change in any of the three test tubes. In additional trials he plans to add 2 and 3 teaspoons of iron oxide to two more Zn-$CuSO_4$ reactions.

1. Are these new trials necessary to determine if iron oxide is a catalyst for the reaction?
2. Explain your answer.

07-Core-21C

Several students were studying the reaction in which two atoms of hydrogen (H) combine.

$H + H \mapsto H_2$

Peter Wolf said, "Platinum is the catalyst for this reaction."
Jim Bahr said, "Iron is the catalyst for this reaction."
Leo Lyons said, "Silver is the catalyst for this reaction."

1. How many of these students could be correct?
2. Why?

07-Core-22C

The rate of a reaction often changes with changes in temperature, changes in concentration, or when a catalyst is used.

zinc + vinegar $\rightarrow H_2$

Hydrogen gas (H_2) can be collected in test tubes by water displacement. Describe a procedure you could follow which would show if changing the concentration of the zinc would change the reaction rate. In your procedure, include what things should be varied and what should be kept constant. (HINT: What variables affect reaction rates?)

07-Core-23C

George concluded that because a copper BB was a catalyst for the reaction between potassium iodine (KI) and potassium persulfate ($K_2S_2O_8$), it must, therefore, be a catalyst for the zinc + hydrochloric acid reaction.

1. Do you agree?
2. Explain your answer.

07-Core-24C

Select the two variables which affect the rate of a chemical reaction.

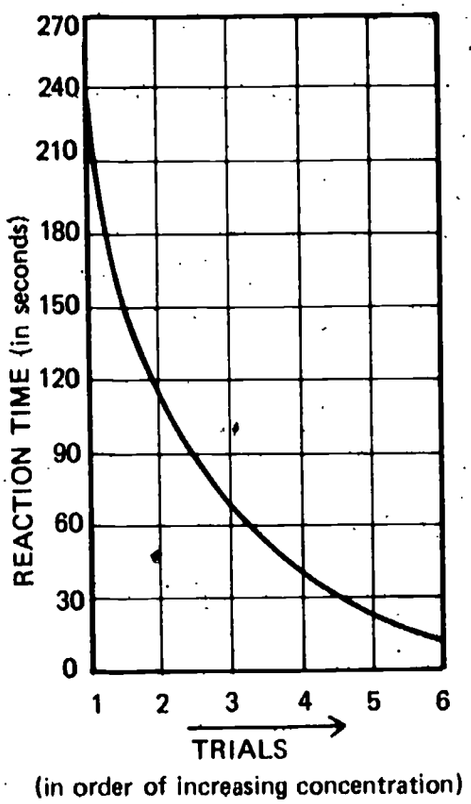
a. The shape of the container used for the reactants
b. The presence of a catalyst with the reactants
c. The scientist who runs the reactions
d. The color of the products
e. The concentration of the reactants

07-Core-25C

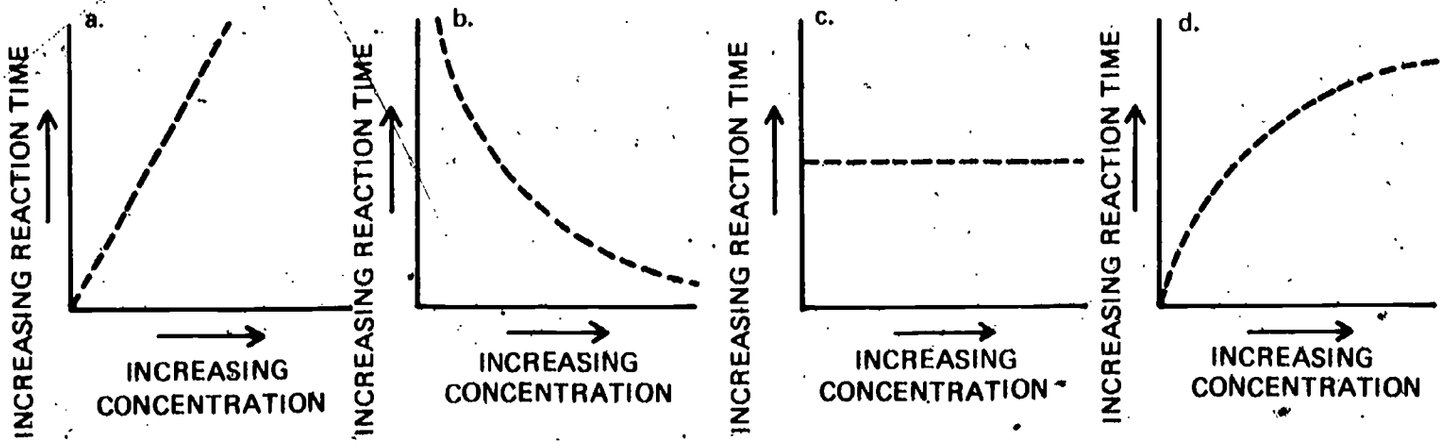
In each set of parentheses select the words which make the following statement true. To produce the highest reaction rate, the reactants of a reaction are at a (high, medium, low) temperature, their concentration is (high, medium, low), and a catalyst is (used, not used).

Study the graph. 07-Exc 13-1-1C

1. In which trial is there the greatest number of collisions between particles of reactants per second?
2. Explain your answer in terms of concentration and reaction time.



Albert studied the effect of changes in the concentration of copper sulfate solution on the reaction time of the reaction zinc + copper sulfate → copper. He defined *reaction time* as the time needed to turn the copper sulfate solution colorless. Which of the graphs below is probably the correct graph for his experiment? 07-Exc 13-1-2C



07-Exc 13-2-1C

Consider the two cases below.

Case 1. Gypsum (wall plaster or plaster of paris) won't burn, even when heated with a torch.

Case 2. Gypsum dust in the air in a gypsum plant reacts so quickly at room temperature that a small spark can cause it to explode violently.

How can you explain the difference in reaction rates between Case 1 and Case 2?

07-Exc 14-1-1C

After you did Excursion 14-1, you saw that reactions involving air take place more slowly in cold air than in warm air. How would the particle model explain this in terms of speed and collisions?

07-Exc 15-1-1C

Corn is put into boiling water for 3 to 5 minutes before it is frozen. The cookbook says that this helps to slow down reactions in the corn which would cause it to spoil even when it is frozen. Explain what the heat does to slow down reactions in living things such as corn.

07-Exc 15-1-2C

Temperatures well above 80°C are needed for peanuts to react with oxygen to produce carbon dioxide + water rapidly enough to produce noticeable heat. Yet the same reaction – peanuts plus oxygen – produces carbon dioxide and water and noticeable amounts of heat at 37°C in your body. Why?

The sodium hydroxide (NaOH) solution that you added to the uncooked meat and egg white in Chapter 16 wasn't very concentrated. Suppose your teacher made the solution more concentrated. What effect would a more concentrated solution of NaOH have on the reaction? **08-Core-1C**

In Activity 16-11, you added sodium hydroxide (NaOH) to urine and egg white. The reactions of urine and egg white with NaOH would have given off ammonia (NH_3) gas, which would have bubbled up through the Nessler's solution at room temperature. Why, then, did you heat the reaction? **08-Core-2C**

Before you begin, tell your teacher that you are going to do this check. **08-Core-3C**

Is there any change in the odor of phenol red when HCl is added to it? To answer this, do the following.

1. Put 6 drops of phenol red into a test tube.
2. Smell it.
3. Add 2 drops HCl.
4. Smell the mixture.

Are the smells noted in steps 2 and 4 the same or different?

You learned in Chapter 16 that egg white, potato, urine, and uncooked meat contained the elements hydrogen and nitrogen as NH_3. If you had tested further, you would have found that carbon and oxygen were also present. How would you explain that these substances contain the same elements and yet are so different? **08-Core-4C**

Blair tested five materials for the presence of ammonia, copper, and sulfate. His results are shown in the table below. **08-Core-5C**

SUBSTANCE TESTED	AMMONIA PRESENT	COPPER PRESENT	SULFATE PRESENT
Red	no	yes	yes
Green	yes	no	yes
Orange	no	no	no
White	no	yes	no
Pink	yes	no	no

Write the colors of any substances which you are sure contain nitrogen.

Jerry tested a purple solid [$Fe(NO_3)_3$] and a blue solid [$Cu(NO_3)_2$] by putting each into a different flask with 10 ml NaOH and heating the two flasks. He bubbled each of the gases given off through test tubes containing 4 ml of Nessler's solution. No color change was observed in the test tubes for gases from either of the substances. Jerry concluded that the substances did not contain nitrogen. **08-Core-6C**

1. Do you agree or disagree?
2. Explain your answer.

08-Core-7C

Before you begin, tell your teacher that you are going to do this check.

Get bottle C from box 08-Core-7. Use as much of the substance in the bottle as you can get on the end of a wooden splint, and test it for ammonia. Open your textbook and follow the Nessler's test procedure outlined on pages 233 through 235. Report your results and conclusions.

08-Core-8C

Before you begin, go tell your teacher that you are going to do this check.

Is there any change in the odor of phenol red when HCl is added to it? To answer this, do the following.

1. Put 6 drops of phenol red into a test tube.
2. Smell it.
3. Add 2 drops of HCl.
4. Smell the mixture.

Are the smells noted in steps 2 and 4 the same or different?

08-Core-9C

Your early investigations show that all the substances in nature are made up of only about 100 elements. Then, in Chapter 16, you as a scientist tested this concept again by testing many substances to see if nitrogen was present in the form of ammonia. Why do scientists keep testing accepted concepts?

08-Core-10C

You used Congo red indicator in the reaction between stomach acid and antacid to tell when all the antacid was used up. How do such indicators work? Why do they change color when they do?

08-Core-11C

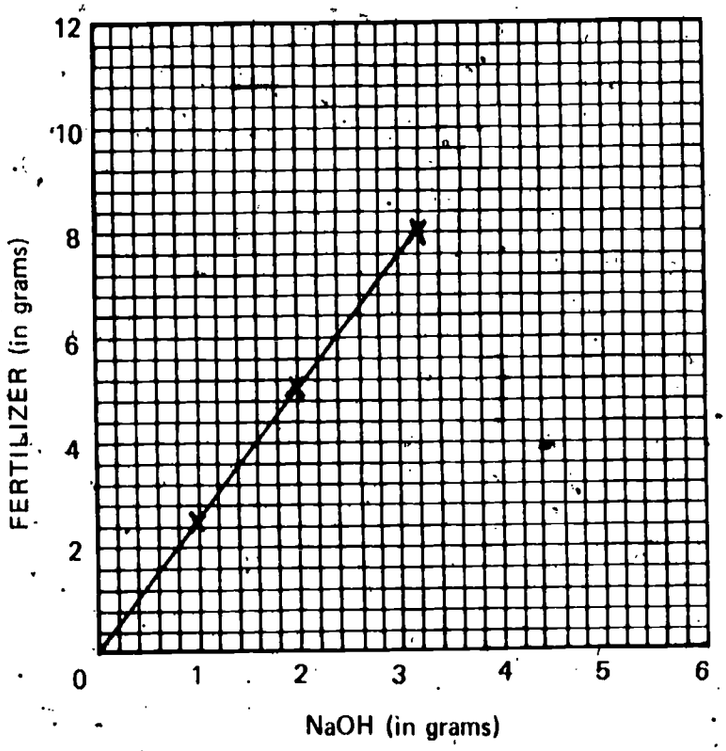
Sean measured the volume of sodium hydroxide (NaOH) needed to react with 1, 3, 5, and 7 ml samples of clear soda (carbonated water), using phenolphthalein as the indicator. He then graphed the data and predicted how much NaOH would be needed to react with 10 ml of carbonated water. Explain why Sean could make such a prediction.

08-Core-12C

You used the chart below in Activity 17-3 when you added sodium hydroxide (NaOH) to 6 ml of citric acid until the phenolphthalein changed color. After doing the procedure once, you did it again and then averaged the number of ml of NaOH added in both trials. Explain why doing two trials and finding the average is better than just doing the procedure once.

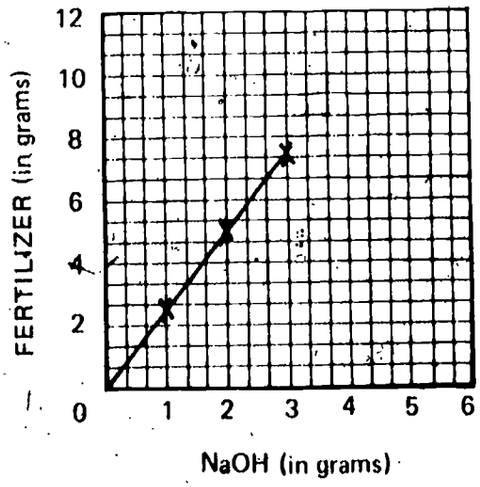
	VOLUME OF CITRIC ACID USED	ACTUAL VOLUME OF NaOH USED	PREDICTED VOLUME OF NaOH
Trial 1	6 ml		
Trial 2	6 ml		
Average	6 ml		

Sandra collected data from three trials of the reaction between NaOH and fertilizer and drew the graph shown below. How many grams of fertilizer will react with 4 g of NaOH? **08-Core-13C**



Sandra put the data from three trials of the reaction between NaOH and fertilizer on the grid below. **08-Core-14C**

1. How many grams of fertilizer will react with 4 g of NaOH?
2. The reason you can answer question 1 is that
   a. fertilizer particles have special reactions.
   b. you have worked with NaOH and fertilizer before.
   c. the relationship between fertilizer and NaOH changes only if more than 10 g of NaOH is used.
   d. reactants always combine in definite numbers?



08-Core-15C

You are to find out how much dilute HCl (acid) can be neutralized by 1 g of the powder in bottle 08-Core-15C. To do this, use the following procedure.

1. Dissolve 1 g of the powder in 15 ml of H_2O.
2. Add 2 drops of Congo red.
3. Add acid in small quantities until you see a permanent color change.
4. Find the amount of acid neutralized.
5. Make a second trial, repeating steps 1, 2, 3, and 4, and then average the amount of acid in the two trials.

08-Exc 16-1-1C

Candi put 500 g (450 cc) of fudge into a pan. After scraping the bowl, she added 50 g (45 cc) more of fudge to the pan. She increased the mass (g) and the volume (cc) of the fudge.

1. What did she do to its density?
2. Explain your answer.

08-Exc 16-1-2C

Get 110 ml of the solution in bottle 08-Exc 16-1-2C. Find the density of the solution. Return the used solution to your teacher.

08-Exc 16-1-3C

Dawn worked with a cleaning liquid whose density was 5.6 g/cc. After the number of each material below, indicate whether it would sink or float in the liquid.

SUBSTANCE	g/cc DENSITY
1. Wood	0.8
2. Iron ball	7.9
3. Gold	19.0
4. Aluminum ball	2.7

08-Exc 17-1-1C

In Activities 17-5 and 17-6, Al measured 1 gram of crushed antacid A on a balance. He put this amount into 10 ml of water and added 5 drops of Congo red. Then, as his partner stirred, he added the acid to the antacid A solution in 1- or 2-ml squirts. It changed to blue when all of antacid A was used up.

1. If Al used 25 ml of water in Activity 17-5, would this affect the amount of stomach acid that was neutralized?
2. Explain your answer.

08-Exc 17-2-1C

Sandy added a clear colorless solution to a beaker of colorless solution, drop by drop. With each drop, she noticed that a small mass of black solid formed and settled to the bottom. Then suddenly the black solid stopped forming. No matter how much more of the liquid Sandy added, no more solid formed. Explain why this happened.

08-Exc 17-3-1C

Get the bottles from box 08-Exc 17-3-1C. Test each solution with litmus, using clean glass stirring rods. After the number of each solution, indicate whether it is an acid, a base, or neither.

George used pH paper and found the pH of samples of acid solutions as shown in the chart below. **08-Exc 17-3-2C**

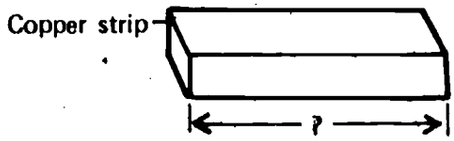
SAMPLE LETTER	pH
a	3
b	5
c	4
d	6
e	2

1. Which solution has the highest hydrogen ion (H^+ ion) concentration?
2. Which solution is the strongest acid?

Get the lettered bottles from box 08-Exc 17-3-3, the pH paper, the pH color scale, and 5 clean glass stirring rods. Copy the list of solutions below. Match each item with the letter of the bottle of solution it describes. **08-Exc 17-3-3C**

1. Acid, strong
2. Acid, weak
3. Neutral
4. Base, weak
5. Base, strong

Below is a diagram of a copper strip. Use a metric ruler to measure its length correctly to the nearest 0.1 cm. **09-Core-1C**



Get the following supplies and equipment from the supply area. **09-Core-2C**

1 50-ml beaker	20 ml $K_2Cr_2O_7$ solution
1 carbon rod	2 test leads
1 strip of lead	1 voltmeter

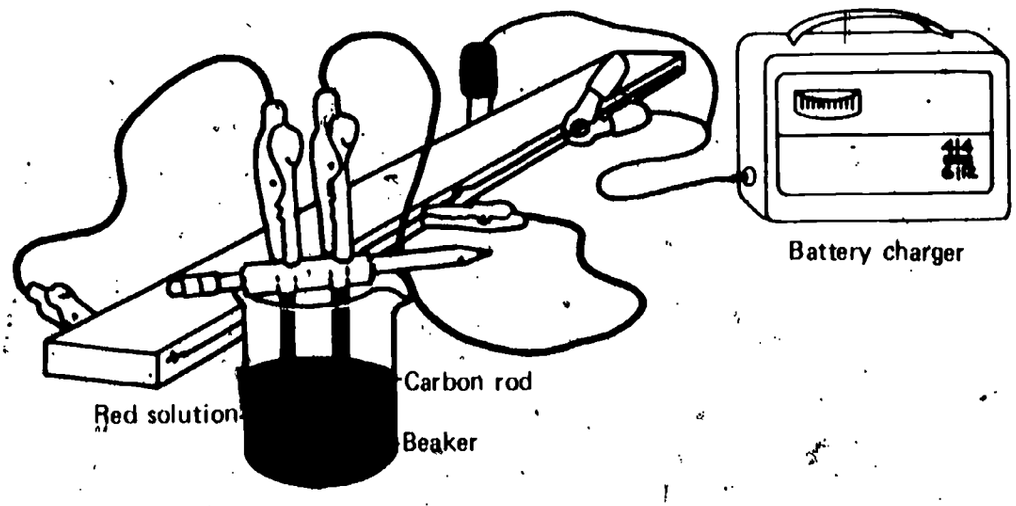
Set up a chemical system which might produce electricity.

1. Does it produce electricity?
2. How do you know whether or not this system produces electricity?

Select the letter of the correct answer. Once a battery has been charged, in what form is the energy stored in the battery? **09-Core-3C**

a. Kinetic
b. Mechanical
c. Magnetic
d. Chemical
e. Electrical

09-Core-4C



Carlos put together the equipment as pictured above. Before he connected the system to the battery charger, he let it sit for five minutes. He noted that both carbon rods were black and the solution was blood-red. After the system had been connected for four minutes, he noticed that one of the rods had become silverish gray and the solution was much lighter.

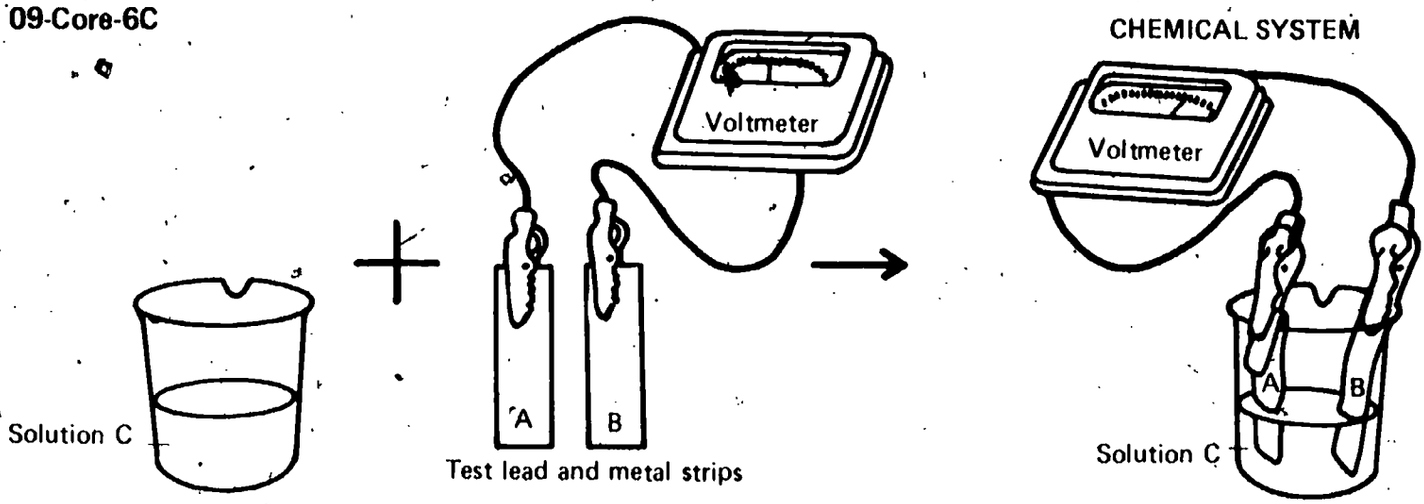
1. What kind of change occurred?
2. What kind of energy caused it?

09-Core-5C

At the very beginning of this course you mixed clear, colorless HCl (acid) with white, solid shell. The shell disappeared and a colorless, odorless gas was given off. None of the reactants were gases.

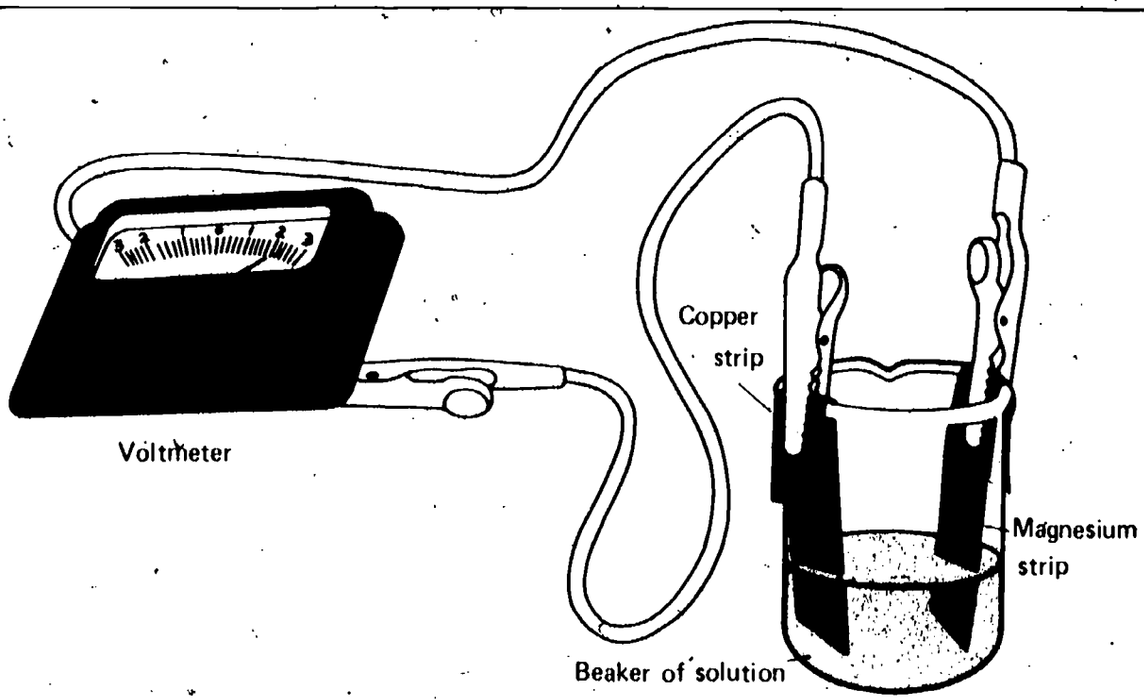
1. Were new particles (atoms) formed?
2. If so, name them. If not, how do you explain the new materials?

09-Core-6C



Eric constructed the chemical system shown in the diagram above. List five things that Eric could observe that would tell him that there is a change in the chemical energy of his system. Assume that Eric used all the additional ISCS equipment he needed.

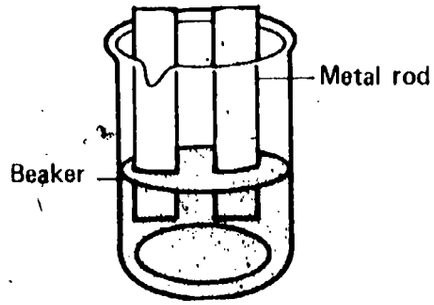
09-Core-7C



David used a strip of copper and a strip of magnesium to build the system shown above. Electrical energy was produced.

1. What was happening to the chemical energy of the system?
2. Was any energy lost or gained?
3. Explain your answer to question 2.

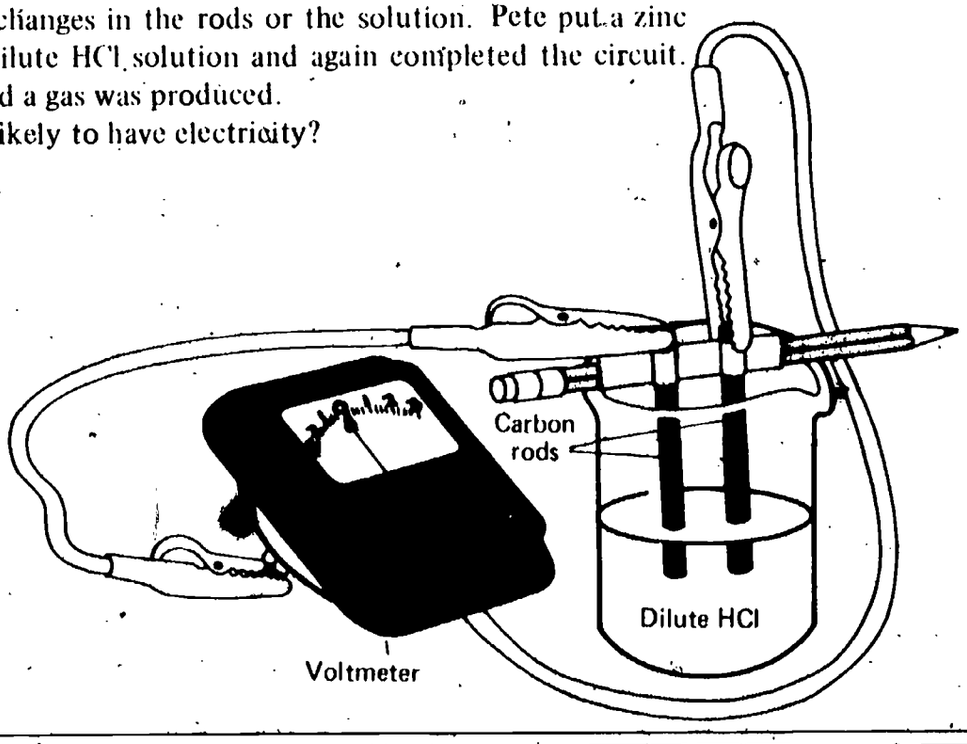
Joe put two rods of the same silver metal into a beaker of a purple solution. He connected the system to a charger. One of the rods turned blue-black and the other turned brown. The solution turned green. He disconnected the system from the charger. He then connected the system to a motor, and the motor started. Describe any visible changes that would occur in the beaker as the motor continued to run. **09-Core-8C**



Paul's new scout flashlight contains two rechargeable batteries. So that he is always prepared, he recharges the batteries once a month. Name the process which describes the changes involving the particles inside the battery when they are charged or discharged. **09-Core-9C**

Kenneth put two carbon rods into a solution of dilute HCl and connected them as shown below. He observed no changes in the rods or the solution. Pete put a zinc strip and a carbon rod into a dilute HCl solution and again completed the circuit. The zinc strip became smaller and a gas was produced. **09-Core-10C**

1. Whose setup is more likely to have electricity?
2. Explain your answer.



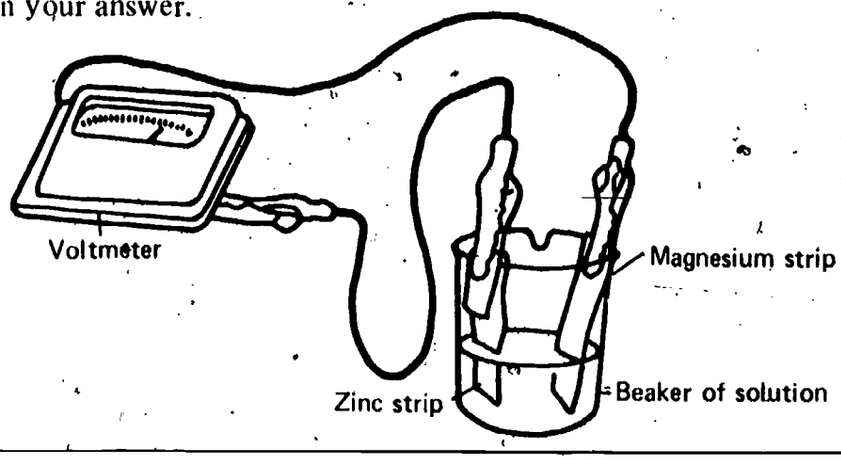
Roger recharges the batteries for his mini-bike on a charger which works the same way as the ISCS charger. **09-Core-11C**

1. What kind of energy is being used to charge the batteries?
2. What is the form of the energy in the battery after it is disconnected from the charger?
3. What form of energy does the battery give off when it is in use?

09-Core-12C

Carl put together the chemical system shown in the diagram. He observed that the system produced electricity for half a class period. Then he studied the chemical system and reported that absolutely no changes had occurred in it.

1. Is it true that there would be no changes?
2. Explain your answer.



09-Core-13C

Write on your answer sheet, the letters of any of the items below which fit the scientific operational definition of *work*.

a. Putting a feather into the trash can
b. Holding a 50 lb bag of cement
c. Memorizing the operational definition of *work*
d. Dissolving sugar in water
e. Reordering the particles in a chemical reaction

09-Core-14C

George put the battery from his mini-bike on a charger. When he calculated the amount of energy used to charge the battery, it was greater than the amount of energy the battery could release later.

1. Was energy destroyed or used up in charging the battery?
2. Explain your answer.

09-Core-15C

Consider the following reaction.

REACTANTS → PRODUCTS

bicarbonate of soda + acetic acid → sodium acetate + water + heat energy released

1. From the information given, the chemical energy of the reactants is (less than, greater than, or equal to) the chemical energy of the products.
2. Explain your answer.

09-Core-16C

Jan noted that the temperature of a liquid dropped when a solid was dissolved in it. On your answer sheet, write the letter of the answer that would be a correct conclusion about the energy in the system.

a. The energy in the system had been changed into another form.
b. The energy in the system had been used up and no longer existed.
c. The energy in the system had been destroyed.
d. Both a and c are correct.
e. Both b and c are correct.

In an insulated Styrofoam cup, Eleanor dissolved 5 g of sugar in 30 grams of water which was at 24°C. The temperature of the final solution was 22°C. The amount of energy present in the materials before dissolving was (less than, equal to, greater than) the energy present in the 35 grams of matter after dissolving. **09-Core-17C**

Cover the bottom of a test tube with white copper sulfate from the jar labeled 09-Core-18. Slowly add 12 drops of water while holding the test tube so you can feel the bottom of it. **09-Core-18C**

1. Did a chemical reaction occur?
2. Would you say the particles were combining or were they separating when you added the water?
3. How can you tell?

Bruce found that the temperatures of a beaker of barium chloride solution and a beaker of copper sulfate solution were both 29°C. When he mixed the two solutions, the temperature rose to 31°C, and a white solid formed. Use the particle model to explain why the temperature rose. **09-Core-19C**

Sandy dissolves some solid potassium chloride (KCl) in water, and the temperature of the liquid drops. According to the particle model, what causes the temperature to drop when the KCl dissolves? **09-Core-20C**

There is energy stored as chemical energy in a 12 g mass of zinc chloride. How can you release some of the chemical energy in the 12 g mass? Select your answer from the choices below. **09-Core-21C**

a. You can crush it.
b. You can freeze it.
c. You can react it to form a different compound.
d. All of the above are correct.
e. None of the above are correct.

The sugar you put on your cereal this morning contains a great deal of chemical energy. What must happen to the sugar or to any substance if it is to give up its chemical energy? **09-Core-22C**

In the next chapter, you will be using two dangerous liquids -- Winkler solution and concentrated sulfuric acid. Assume the two bottles in box 09-Core-23 contain these two liquids. Gather all the equipment you will need to mix 10 drops of the acid with 10 ml of Winkler solution. Ask your teacher to observe you. Mix the liquids and report your observations. **09-Core-23C**

You will be working with Winkler solutions and concentrated sulfuric acid in the next chapter. Chemicals like these can cause a great deal of damage to skin and clothes. List three things that you should do if some of these solutions should spill on someone. **09-Core-24C**

09-Exc 18-1-1C A chemical system (battery) was described in Excursion 18-1. The system couldn't give off electricity until after it was charged. Explain why the system wouldn't give off energy until after it was charged.

09-Exc 18-2-1C Show your teacher the procedure you developed for Excursion 18-2. Your task is to defend what you did or to make a satisfactory change in any part of it that your teacher objects to.

09-Exc 19-1-1C Below is a list of energy conversions. Choose four of them. Write the numbers of your four selected energy conversions on your paper, and then cite an example after each.

1. Electrical to sound
2. Electrical to chemical
3. Light to heat
4. Heat to motion
5. Chemical to electrical
6. Motion energy to heat

09-Exc 19-2-1C Lois made the four solutions shown in the chart below. On your answer sheet, state after the number of each reaction whether it is endothermic or exothermic.

REACTION	SOLID ADDED TO WATER	WATER TEMP. (in °C)	SOLUTION TEMP. (in °C)
1	NH_4Cl	22	20
2	LiBr	24	27
3	KOH	22	29
4	$AgNO_3$	23	21

09-Exc 19-2-2C When a solid like NaCl, which is made up of ions, dissolves in water, two processes which involve energy occur.

1. Name the two processes and tell what is occurring in each.
2. The temperature of the water dropped 2 degrees during the dissolving process. Which of the two processes mentioned in question 1 involves the greater amount of energy in this instance?

Preparing for their experiments with ICR's and yeast beasts, three students did the following: **10-Core-1C**

Perry used the glassware right off the shelf.

Tony washed the glassware with tap water and then with distilled water.

Steve washed the glassware in soapy water. He did not rinse them, but he dried them carefully with paper towels.

1. Which student used the best procedure?
2. What is wrong with both of the other procedures?

Mr. Jackson collected four water samples from a stream. He asked you to find out which sample contained the most dissolved oxygen. You followed directions and added Winkler solutions #1 and #2, starch, H_2SO_4, and $Na_2S_2O_3$. **10-Core-2C**

1. What data would you collect?
2. How would you use the data to tell which sample contained the most oxygen?

You have been studying reactions between ICR's and oxygen. What kind of information would you need to know about a substance like oxygen to write an operational definition for it? **10-Core-3C**

Open your book to Chapter 20 and use it to help you write an operational definition for *dissolved oxygen.* **10-Core-4C**

In Chapters 20 and 21, you studied ICR's, oxygen, and carbon dioxide. You used jars which you could cap tightly. Until this section of the text you used beakers. Why was it important to your activity to be able to cap the jars tightly? **10-Core-5C**

Last week, using the same procedure as that used for jar B below, Glenn found that it took 55 drops of $Na_2S_2O_3$ to remove the color from a mixture of 4 drops of H_2O_2, 120 ml of water, Winkler solutions, H_2SO_4, and starch which he had just made. Today, he did the following, using jars A and B. **10-Core-6C**

Jar A

1. Put in 120 ml water.
2. Added 4 drops H_2O_2.
3. Added 3 fish, and capped the jar.
4. Waited 12 minutes.
5. Removed the fish.
6. Added Winkler solutions and H_2SO_4.
7. Added 6 drops of $Na_2S_2O_3$.
8. Added 1 drop of starch solution.
9. Added 8 drops of $Na_2S_2O_3$ to remove color.

Jar B

1. Put in 120 ml water.
2. Added 4 drops H_2O_2.
3. Added nothing, but capped the jar.
4. Waited 12 minutes.
5. Removed nothing.
6. Added Winkler solutions and H_2SO_4.
7. Added 13 drops of $Na_2S_2O_3$.
8. Added 1 drop of starch solution.
9. Added 42 drops of $Na_2S_2O_3$ to remove color.

1. What term describes how Glenn used jar B today in this activity?
2. Since Glenn had already recorded his results for the procedure used in jar B last week, why did he have to do the same reaction today as part of this activity?

10-Core-7C

Phil put three ICR's into each of two jars, X and Y. Each jar also contained 150 ml of water and 5 drops of hydrogen peroxide (H_2O_2). After 15 minutes, he removed the ICR's from jar X and tested the water for its amount of oxygen and carbon dioxide. Twenty minutes from the start of the activity, he removed the ICR's from jar Y and tested for amounts of oxygen and carbon dioxide.

1. Which, if either, sample will contain less oxygen?
2. Which, if either, sample will contain more carbon dioxide?
3. Explain why you answered as you did.

10-Core-8C

Rhonda had a gallon of water. She tested a sample of it, using the Winkler test, and found that the water contained oxygen. Rhonda said she was not sure if the rest of the water contained oxygen because she had tested only a small sample.

1. Does the rest of the water contain oxygen?
2. Explain your answer.

10-Core-9C

Five aquanauts live at the bottom of the sea for several weeks at a time doing research for the United States. They live in a dry, airfilled steel capsule, much like astronauts live in.

1. If the concentration of aquanauts is increased to seven per capsule what will this do to the rate at which oxygen is used up?
2. What will it do to the rate at which carbon dioxide is produced?
3. Why?

10-Core-10C

In Chapter 21, you studied the effect of temperature on the reaction rate of fish. During the 20 minutes that the fish in the jar were in ice water, the temperature was dropping slowly. (See Activity 21-9.) Why not put the fish directly into some iced distilled water so that they would be at the lower temperature for the full 20 minutes?

10-Core-11C

In Pocono Lake, the temperature in early spring is 8°C. In August, the water temperature rises to 21°C.

1. How would this warming of the lake affect how often a water snake must surface to take in new oxygen and release carbon dioxide?
2. Explain your answer in terms of reaction rates.

10-Core-12C

Select from the list below all the evidences that indicate that chemical reactions take place in living things.

a. Stomach acid is neutralized in definite quantities, as are other acids.
b. Concentrations are altered.
c. Temperatures of living things alter the rate of new material formation.
d. New materials (products) are formed.
e. All of the above are correct.

Caroline produced two samples of carbon dioxide (CO_2), one by the action of live bacteria on apple juice to make vinegar and one by reacting HCl with limestone. The samples were mixed, but Caroline said they could be identified. She said they would react differently in chemical tests because the CO_2 from the apple juice was made by and from living things and the CO_2 from limestone was not. **10-Core-13C**

1. Do you agree or disagree?
2. Why?

Mr. Will Fixit is a pit crew chief for Bluestreak Race Cars. He claims that his cars run on a reaction of the reactants oxygen and an alcohol-benzene mix. **10-Core-14C**

1. Predict from your knowledge of reactants in reactions what should happen to the amount of alcohol-benzene mix in the car as it races toward the checkered flag.
2. Why does this happen?

The amount of oxygen dissolved in water is indicated by how much $Na_2S_2O_3$ is used after using Winkler solutions. Mary says that oxygen can be more active at some times than others. She said the same amount of oxygen can react with different amounts of $Na_2S_2O_3$ depending on how active the oxygen is in that sample. **10-Core-15C**

1. Do you agree or disagree?
2. Why?

Chuck discovered that three ICR's removed oxygen from the water. There are two possible reasons that this happened. Either the ICR's store oxygen in their bodies, or the ICR's use absorbed oxygen in a chemical reaction. **10-Core-16C**

1. State any evidence from the activities that you have done in class that would help you choose one of the above.
2. How would this evidence help you choose?

Which of the following is the *best* statement fitting both your model for chemical reactions and the results of your activities with the ICR? **10-Core-17C**

a. They *definitely show* that chemical reactions do not occur inside the ICR's as they do in test tubes involving only nonliving things.
b. They *establish proof* that chemical reactions take place inside the ICR's as they do in test tubes involving nonliving systems.
c. They *prove* that your model must be true.
d. They *suggest* that reactions take place inside of ICR's as they do in test tubes involving only nonliving systems.
e. b and c

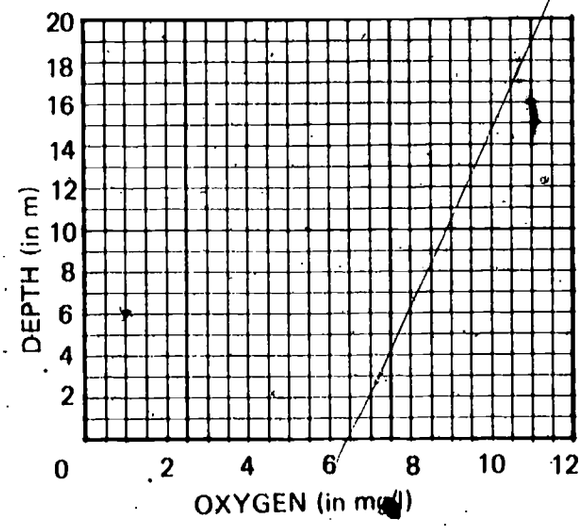
Walt took his temperature. It was 37°C. Then he went on his paper route and delivered the morning papers in below zero temperature. When he got home, his body temperature was still 37°C. Certain processes convert the energy in food into heat that keeps human body temperature from dropping even on very cold days. What are these processes called? **10-Core-18C**

10 Exc 21-1-1C A government lab has four jars of equal size containing samples of breath from three cigarette smokers and one nonsmoker. Suppose there are no Winkler solutions available. How can you find out which sample of breath contains the most oxygen?

10 Exc 21-2-1C Get a piece of graph paper from your teacher, and label it as shown on the grid below. Graph the data about Lake Iggy below. Then for each kind of fish listed, place an X on the grid at the lowest depth at which that kind of fish could survive. Beside the X, write the name of the fish.

DISSOLVED OXYGEN IN LAKE IGGY	
DEPTH (in m)	OXYGEN (in mg/liter)
0	10.0
2	9.8
4	9.4
6	5.2
8	2.2
10	1.5
12	1.2
14	0.8
16	0.5
18	0.5

LOWEST CONCENTRATION OF DISSOLVED OXYGEN AT WHICH FISH CAN SURVIVE FOR 24 HOURS	
TYPE OF FISH	DISSOLVED OXYGEN (in mg/l)
Trout	8.7
Kingfish	1.8
Redfish	5.0



Get box 11-Core-1. It contains five stoppered test tubes. Each tube contains the same amount of Benedict's solution but different concentrations of glucose solution. Arrange the test tubes in order, beginning on the left with the tube with the lowest glucose concentration and ending with the tube of highest concentration. Show your teacher your ordering. **11-Core-1C**

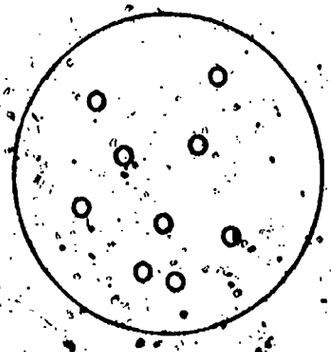
Get 7 drops of each of the four solutions in the bottles in 11-Core-2C. Put each solution into a separate test tube, which is labeled with the number of the bottle you get the sample from. Your task is to judge the amount of glucose in each sample, using the procedure stated in Activities 22-12 through 22-14. **11-Core-2C**

Put the solutions in order from lowest glucose content to highest glucose content. On your paper, list the numbers of the test tubes in that order.

An earthworm takes in oxygen which reacts and is released as carbon dioxide (CO_2). What is the source of the element carbon in the CO_2? **11-Core-3C**

a. It is made from other elements in the worm's body.
b. It grows in living plants and animals.
c. It is present in some form in the food eaten by the worm.
d. The worm gets it only from burnt wood.
e. Both a and b above are sources.

Suppose that the figure below shows the number of yeast beasts in 1/5 of a drop of a yeast solution. Calculate the number of drops you would expect to find in the entire drop of yeast solution. **11-Core-4C**



You ground yeast beasts with sand and killed them by tearing them apart. Yet the broken yeast beasts cause the breakdown of glucose into carbon dioxide and water to happen faster than do whole yeast beasts. Why? **11-Core-5C**

The yeast beasts broke glucose down into carbon dioxide (CO_2) and water. As the breakdown occurred, the yeast organisms grew and became more numerous. In other words, the mass of the yeast increased. The breakdown reaction was as follows: **11-Core-6C**

glucose + yeast → CO_2 + water + more yeast

1. If 25 grams of glucose were put into the reaction container, would 25 grams of CO_2 and water be formed?
2. Explain your answer.

11-Core-7C

Case 1. Dr. Cutter tried in the laboratory to break down fish, using chemicals he knew existed in large quantities in a cat's stomach. He found that he had to add small amounts of another chemical as a catalyst.

Case 2. Dr. Cutter fed fish to his cat. The cat's stomach broke the fish down into simpler substances. Dr. Cutter did not have to add a catalyst to the reaction in the cat's stomach.

Explain why the reaction in case 1 needed a catalyst, but none was needed in case 2.

11-Core-8C

Marshmallows on a plate will not react with oxygen to produce carbon dioxide (CO_2) and water rapidly enough to give off noticeable heat at 37°C. Yet the same reaction produces CO_2, water, and noticeable amounts of heat at 37°C in your body. Explain why this occurs.

11-Core-9C

Doug read that such green plants as crab grass carry out the following reaction in the presence of sunlight.

water + carbon dioxide → glucose + oxygen

Doug doesn't think that such a reaction can be carried out in a test tube even if he uses the catalysts used by the plants. He says that the catalyst will work in a reaction only inside a living green plant.

1. Do you agree or disagree with Doug?
2. Why?

11-Core-10C

In a cartoon in Chapter 23, Mini Fini, the fish, claims she contains catalysts.

1. Do you contain catalysts?
2. What evidence supports your answer? (Hint: Peanuts and marshmallows release energy inside of you at body temperature.)

11-Core-11C

Now that you have worked with fish and yeast, name three variables that affect reaction rates in living things.

11-Core-12C

1. Suppose you put 4 beakers of zinc and diluted vinegar (chemical systems) into a cupboard. You also put 3 gallons of vinegar, 8 pounds of zinc, and 50 beakers in the cupboard. If you checked them in 4 hours, would you find fewer than 4, exactly 4, or more than 4 complete systems?
2. Suppose you put 4 yeast beasts (chemical systems) into a cup of warm water and sugar. Tomorrow, would there be fewer than 4, exactly 4, or more than 4 chemical systems?
3. What is the difference between the zinc-vinegar chemical systems and the yeast beasts which explains the difference in your answers to questions 1 and 2?

Honey said, "In ISCS we used living yeast beasts. We were told not to heat them too much. Since it's the catalyst in the yeast beasts, not the live yeast beasts themselves, which is important, we could have heated the glucose reaction so that it would have gone faster. **11-Core-13C**

1. Do you agree or disagree with Honey?
2. Why?

Select the letter of the chemical reaction in which oxygen is a reactant. **11-Core-14C**

a. Water freezing
b. Fuel oil burning
c. Sodium iodide and iodide dissolving in the same test tube
d. Copper sulfate dissolving

Define the unit of heat *kilocalorie* in terms of water. **11-Core-15C**

Define *calorie* in terms of water. **11-Core-16C**

Rhoda forgot the heat unit when she calculated the change in heat energy of a 20 gram mass of water raised 2°C in temperature. Choose the letter of the answer below which includes the heat unit Rhoda should have used. **11-Core-17C**

a. 40 calories
b. 40 newtons
c. 40 kilocalories
d. 40 meters
e. 40 Btu

Get any equipment you need, and heat 175 ml of water for two minutes. You are to calculate the change in the heat energy of the water during the heating period. Record and label all the measurements you make. **11-Core-18C**

If l is the symbol for length and you were asked to measure Δl, what would you measure? **11-Core-19C**

How many calories of heat energy are required to raise the temperature of 15 grams of water from 20°C to 80°C? **11-Core-20C**

Which of the following variables are important but are ignored when you use the ISCS cola-can heat-measuring device to calculate the heat of the marshmallow-oxygen reaction? **11-Core-21C**

a. Heat lost to the can
b. The color of marshmallows
c. Heat lost to the surrounding air
d. None of the above

11-Core-22C	Select the variables which affect the amount of temperature change when crystals of sodium nitrate are being heated. a. The length of time the crystals are heated b. The source of the sodium nitrate c. The person heating the sodium nitrate d. The amount of matter heated e. The amount of heat supplied per minute
11-Core-23C	Chemical energy is the main form in which energy is put into your body. List two forms of energy into which your body converts that chemical energy.
11-Core-24C	The sugar in grape juice contains a great deal of chemical energy. 1. What must happen to the sugar if it is to give up its chemical energy? 2. As it gives up its chemical energy, what happens to the atoms of which the sugar is made?
11-Core-25C	Maple syrup contains a lot of energy. In what form is this energy stored?
11-Core-26C	1. Are people HCR's (human chemical reactors)? 2. If you think so, name three reactants and three products of an HCR. If not, what is their energy source?
11-Exc 22-1-1C	Dede Devine's pecan sticky bun recipe from 1865 includes both yeast and glucose. On the basis of what you learned in Excursion 22-1, state what yeast and glucose do to dough and how they do it.
11-Exc 23-1-1C	Helen wants to find out if xerose is a substance that will act as a catalyst for the breakdown of starch. If the xerose is a catalyst, what visible result should she expect to observe after mixing together the xerose, starch, and the iodine solution?
11-Exc 24-1-1C	Lynn cooled 25 g of water from 88°C to 28°C. How many calories of heat were lost?
11-Exc 24-1-2C	A tablespoonful of peanut butter contains 93 Calories. Suppose that all the energy in a tablespoonful of peanut butter were released as heat energy. How many grams of water can this much heat energy raise 1°C?

Get your textbook, and use it to do this check. In the left-hand column are statements of five assumptions from the particle model. In the right-hand column is a list of ISCS activities that you have done, each of which involves one of these assumptions. Number your answer sheet 1 through 5. After the number of each assumption, write the letters of all of the activities listed which are related to it. A number may have more than one letter matched with it. (Hint: Read all the assumptions before reading any of the activities. If you have trouble matching any of the activities, look in your text for that activity and find out what assumptions are related to it.)

Assumptions of the Particle Model

1. When a chemical reaction occurs, different matter particles combine in definite numbers.

2. Chemical reactions often release heat energy or absorb it.

3. Neutral molecules contain electrically charged particles.

4. Increasing the concentration of reactants increases the rate of a reaction.

5. Because matter is held together by electrical forces, chemical changes may absorb or release electrical energy.

Activities

a. The lead (Pb)-sodium sulfate (Na_2SO_4) system absorbed electrical energy and was changed in so doing.

b. When different quantities of lead nitrate [$Pb(NO_3)_2$] were reacted with an unchanging quantity of potassium iodide (KI), sometimes iodide (I) atoms were left over, and sometimes lead (Pb) atoms were left over.

c. The amount of reaction between zinc (Zn) and copper sulfate ($CuSO_4$) could be determined by measuring ΔT.

d. Five drops of oxalic acid ($H_2C_2O_4$) plus 5 drops of water plus 10 drops of potassium permanganate ($KMnO_4$) take more time to turn gold color than 10 drops of oxalic acid ($H_2C_2O_4$) plus 0 drops of water plus 10 drops of potassium permanganate ($KMnO_4$).

e. A sugar solution wouldn't allow electricity to flow through it to light a bulb, but crystals of sugar were attracted to both positively and negatively charged vinyl strips.

f. The zinc (Zn)-potassium dichromate ($K_2Cr_2O_7$) system released electricity, and the $K_2Cr_2O_7$ solution changed color.

g. After finding how much sodium hydroxide (NaOH) reacts with 2 ml of citric acid ($C_6H_8O_7$), you successfully predicted how much $C_6H_8O_7$ would react with 1, 4, and 5 ml of NaOH.

h. It took more phenol red to get a pink color in water which had contained 2 goldfish than in water which had contained only 1 goldfish.

i. When particles like lead (Pb) and iodide (I) are in solution and combine to form the solid lead iodide (PbI_2), the temperature rises.

j. One of each antacid tablet neutralized about the same amount of stomach acid.

12-Core-1CC

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Assumptions of the Particle Model

1. All matter is made up of only 100 or so different kinds of matter particles.

2. Molecules are made of atoms and can be broken down into atoms or simpler molecules.

3. Chemical reactions are rearrangements of matter particles.

4. When a chemical reaction occurs, different matter particles combine in definite numbers.

5. A catalyst increases the rate of a reaction when it is present in small quantities.

Activities

a. Four different colored substances all contained copper.

b. After finding how much sodium hydroxide (NaOH) reacts with 2 ml of citric acid ($C_6H_8O_7$), you successfully predicted how much $C_6H_8O_7$ would react with 1, 4, and 5 ml of NaOH.

c. Egg white, raw meat, and fertilizer all contained nitrogen.

d. When a small piece of copper was added to a mixture of potassium iodide (KI) and potassium persulfate ($K_2S_2O_8$) solutions, it took less time for the mixture to turn blue-black than when the copper wasn't present.

e. One g of each antacid tablet neutralized about the same amount of stomach acid.

f. When the colorless solutions of lead nitrate [$Pb(NO_3)_2$] and potassium iodide (KI) reacted, a yellow solid, lead iodide (PbI_2), was formed. The yellow solid contained atoms of lead (Pb) and iodide (I_2). No new elements were found in the reaction.

g. When a small amount of iron chloride ($FeCl_3$) powder was added to hydrogen peroxide (H_2O_2), oxygen gas was released more rapidly.

h. The breakdown of glucose into carbon dioxide and water went faster when the insides of ground-up yeast beasts were added to the reaction.

i. When different quantities of lead nitrate [$Pb(NO_3)_2$] were reacted with an unchanging quantity of potassium iodide (KI), sometimes iodide (I) atoms were left over and sometimes lead (Pb) atoms were left over.

j. When sucrose is heated with HCl, fructose and glucose are formed.